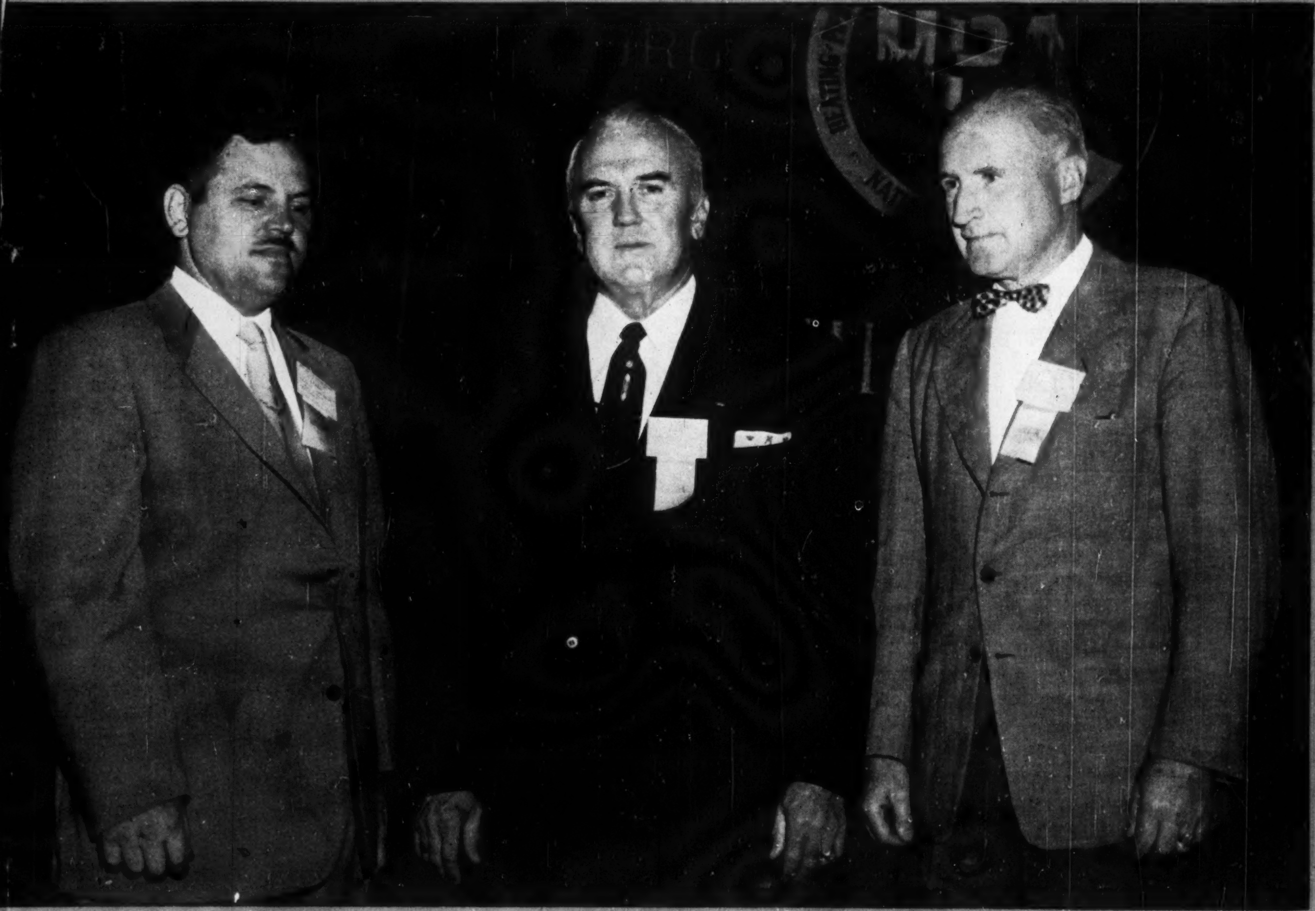
Heating Piping & Air Conditioning

JULY 1954

INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Page 125—Journal Section of The American Society of Heating and Ventilating Engineers



Edward Jungbert, J. DeWitt Morrow and George Hall are the HPACCNA's new officers

FAST GROWING applications of heating, piping and air conditioning feature discussions at the HPACCNA's annual convention 94

HTHW Serves Plant 13 Years 83

High Velocity System Ventilates Office .87

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PRECISION THREADS

Fitting is rigidly clamped ready for threading in a Grinnell-designed, precision tapping machine.

Modern manufacture, rigid inspection insure high quality of

GRINNELL PIPE FITTINGS

The strict standards to which Grinnell manufactures every pipe fitting insure threads of true dimension, full depth. Grinnell pipe fittings make up and tighten easily — providing permanent, leak-proof joints. Precision threading machines, operated by experts, assure the maintenance of these high standards.

Quality control includes alignment tests, high pressure hydrostatic tests and comparator checks on the accuracy of threads and chamfer. Here are some of the other advantages that you can count on when you specify Grinnell Pipe Fittings:

- **High quality metal**
- **Dimensional accuracy**
- **Clean inside surface for smooth flow**
- **Proper chamfer for easy starting and protection of first thread**

To make fittings the safest, strongest link in your piping system . . . choose from the wide Grinnell line. Available from your local Grinnell Distributor or a Grinnell Warehouse.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

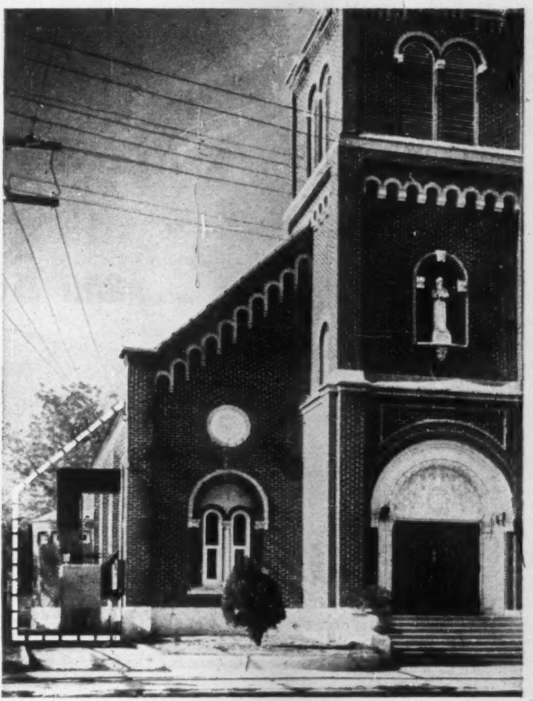
Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

outside installation usAIRco "packaged" central station air conditioners save floor space, ductwork and labor costs

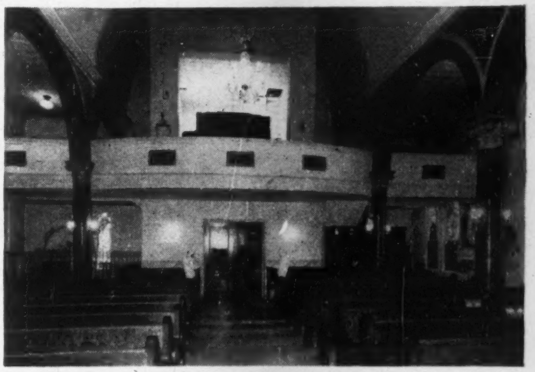
usAIRco's outdoor locations of equipment have proved the answer to cooling existing buildings when lack of space prohibits the usual type of air conditioning installation.

To air condition the Church of St. Francisco di Paola, a religious landmark of San Antonio, Texas, conserve space and preserve the architectural beauty of the church, inside and out, A. H. Thomas, engineer for G. H. Dillard Company, recommended placement of a 20 h.p. usAIRco packaged central station unit (RK) outside the building. The unit was shielded from view by construction of a matching extension to the brick front of the church. The supply duct leads through the outside wall and is concealed in the wall-like railing of the organ and choir loft located at the rear of the church. Five discharge grilles in the choir loft railing deliver the conditioned air at a low velocity, providing quiet, draftless cooling throughout the church. To allow for return of air, two stained glass windows, adjacent to the exterior location of the unit, were removed and replaced with return grilles.

Business needs demanded that the Big Apple Super Market of College Park, Georgia install an air conditioning system. Lack of floor space was the major obstacle. To overcome it, a usAIRco 20 h.p. Model RK was installed outside at the rear of the store. The built-in evaporative condenser saves 95% in water consumption by continuous recirculation.



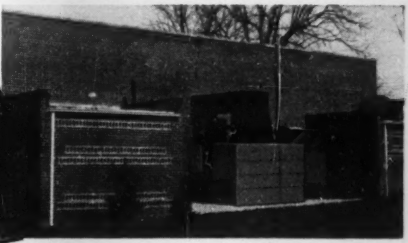
Central station air conditioner of St. Francisco di Paola Church is concealed by extension of front wall of building, shown by dotted line.



Five discharge grilles at rear of church and two large return grilles are the only visible signs of air conditioning inside the building.

BIG APPLE SUPER MARKET

Front view of Big Apple Super Market, air conditioned by usAIRco RK unit.



RK is installed at rear of store, with ductwork leading into store through rear wall.

usAIRco
30 YEARS OF AIR CONDITIONING

For detailed information on usAIRco RK's, write Dept. HP-74

UNITED STATES AIR CONDITIONING CORPORATION

MINNEAPOLIS 14, MINNESOTA *Export: 13 E. 40th St., N.Y. 16, N.Y., U.S.A.*

REDWOODS LIVE 1,000 YEARS

(and more)

...and BUSH Uses All-Heart Redwood

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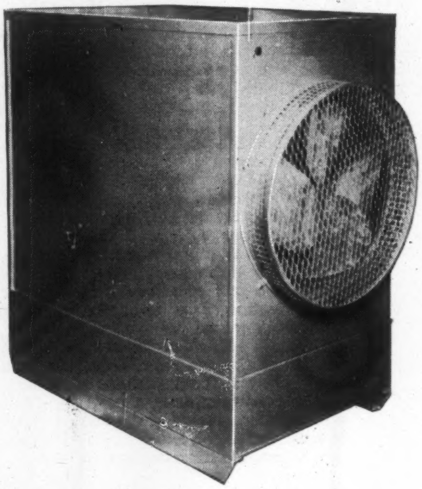
Heartwood of these forest giants, which flourish in the area washed by Pacific fogs, is strong, durable, even-grained.

The wetted deck surface of BUSH Propeller-Fan cooling towers is made from all-heart Redwood fill . . . nail-less . . . to assure long life and trouble-free operation. This hard, durable wood needs no artificial treatment to resist fungus deterioration.

- Available in a capacity range from 2 to 15 tons for both residential and commercial air conditioning applications.
- Panels are of galvanneal, specially coated for all-weather protection and continued attractive appearance. Panels are first zinc chromate prime coated inside and out . . . then rubber coated inside and coated outside with Vinyl-base paint of high chlorinated rubber content.
- BUSH Propeller-Fan cooling towers are attractive in appearance . . . have clean-lined contours . . . no bulky projections.
- All motors are totally enclosed and have built-in overload protection. Standard motors are 110 volts, single phase, 60 cycle.
- Motors, fans and drives are of sufficient capacity to handle average ductwork for indoor installation if desired.
- Distribution pan, top and fan guard are all easily removable for quick access to all internal parts.



Write TODAY for free descriptive bulletin on BUSH Propeller-Fan Cooling Towers.

BUSH

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West Hartford · 10 · Connecticut

Heating Piping & Air Conditioning

Vol. 26 No. 7

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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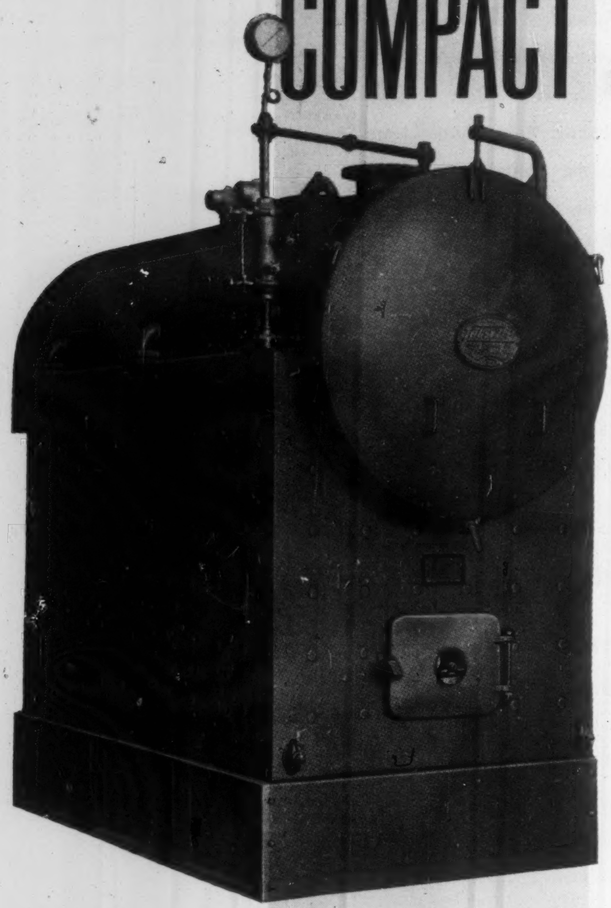
"COMPACT" IS THE WORD FOR THIS SPACE-SAVING TITUSVILLE BOILER

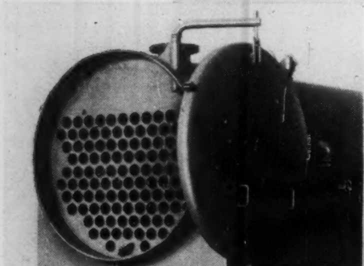


ALL SIZES FROM 129 TO 2500
SQ. FT. OF HEATING SURFACE

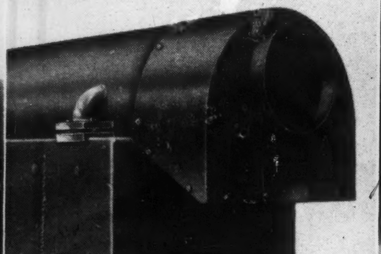
S.B.I. rated for known, dependable performance

Modern, space-saving design makes the "Compact" Steel Heating Boiler particularly adaptable to cramped boiler-room areas . . . sturdy welded construction, large combustion chambers, long fire travel and positive circulation combine for high efficiencies and years of low-maintenance service! Get the facts—write for "Compact" Bulletin B-3000-B today.

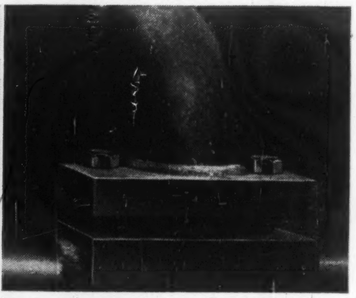
TYPICAL "COMPACT" ENGINEERING FEATURES



Full width flue doors give quick access to all tubes for cleaning.



Smoke box at rear of boiler provides a natural soot hopper, easily cleaned.



Ample number of side circulators insure positive circulation, increased efficiency.

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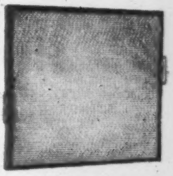
A DIVISION OF Struthers Wells

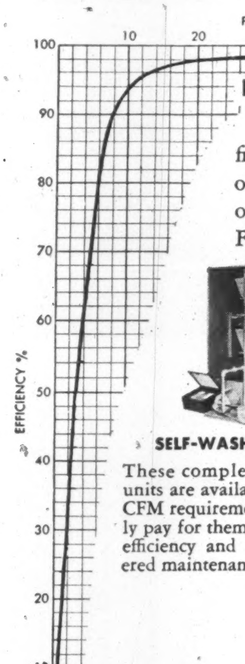
THE TITUSVILLE IRON WORKS COMPANY
TITUSVILLE, PENNA.
Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement

YOURS FREE!

Farr Company Offers a Competent Staff of Field Engineers Plus Laboratory Services to Assist You with Your Air Filtration Problems

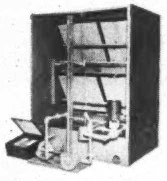
Selection of the proper air filters to meet your exact needs is most important. For this reason, Farr Company maintains competent field and laboratory engineers who are well qualified to determine the best type of filter needed to solve your particular problem. This free service can be invaluable to you in guaranteeing complete satisfaction with your air handling system.





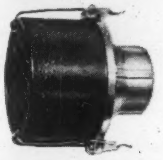
LATEST AIR FILTER TESTING METHODS ASSURE YOU OF PEAK PERFORMANCE

After years of research, Farr engineers have developed a radically improved method of measuring filter efficiencies that takes the guess work out of air filtration. Now, for the first time, filter performance on your job can be predetermined. This eliminates costly mistakes and needless expense. This is just one of the many money-saving services available to you *at no cost.* Write today for full information on FAR-AIR* products.



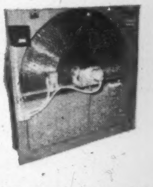
SELF-WASHING FILTERS

These completely automatic units are available to meet any CFM requirement. They quickly pay for themselves in greater efficiency and drastically lowered maintenance costs.



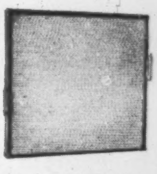
ENGINE FILTERS

Many types and sizes of engine and compressor filters are available or can be engineered to your requirements.



ROTARY COOLERS

These efficient economical units have proven highly successful under hot, low humidity climatic conditions. They are available for commercial and home use.



PANEL FILTERS

FAR-AIR panel filters are available in many types and sizes. Each design has been engineered for peak performance and substantial economy over ordinary types.

Whatever your air filtering problem is, it will pay you to mail the coupon today for expert engineering assistance. Remember, this is a FREE SERVICE!

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Better by Farr

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Los Angeles 45, California

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I would ☐ would not ☐ require engineering assistance.

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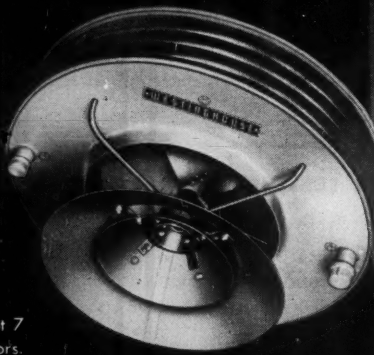
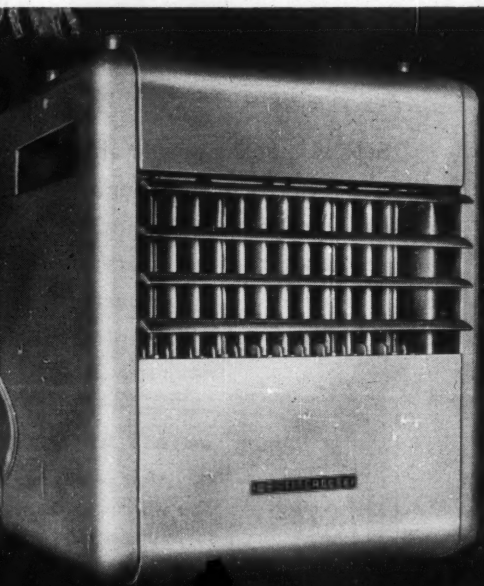
FLOW HEAT EVENLY OVER LARGE AREAS . . .

Westinghouse Speedheaters®

Horizontal Speedheater. Output 7 to 8 times that of conventional radiators. 11 standard sizes for steam, hot water. Capacities 17,800 to 300,500 BTUH.

Downblast Speedheater. With multiple cone diffuser for positive control of air spread. Capacities 24,700 to 400,000 BTUH.





Gas-Fired Speedheater. 7 standard sizes. Capacities 25,000 to 200,000 BTUH.

Outstanding features assure quiet, reliable operation . . . easy installation:

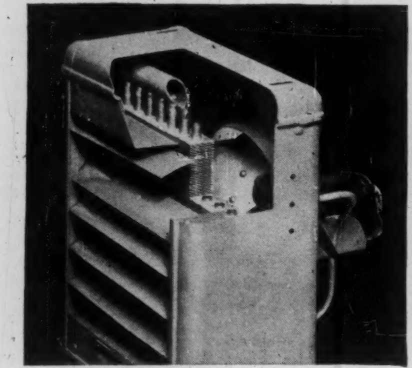
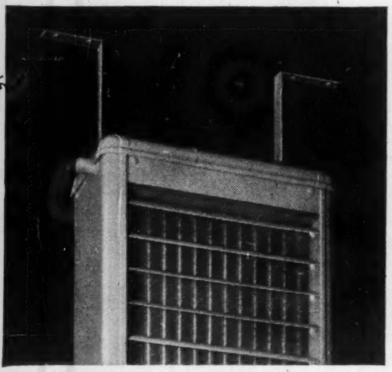
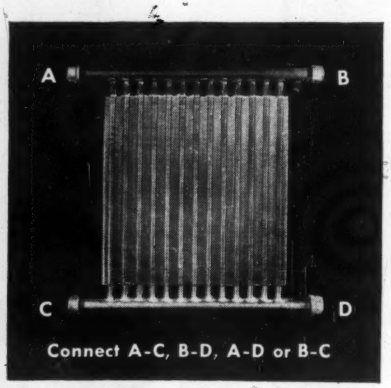


Plate fins cut noise, maintain uniform air flow, minimize clogging of coil with dirt and dust. Adjustable louvers spot or spread heat directly into work zone. Unit requires no warm-up—a flip of a switch generates *instant heat.*



Pliable steel hangers, a Westinghouse exclusive, simplify installation of Horizontal Speedheaters. Heavy-gauge welded steel casings, heavy seamless copper tubes, rugged motor and fan increase service life.



Connect A-C, B-D, A-D or B-C

Four connection combinations further simplify installation of Westinghouse Horizontal Speedheaters . . . reduce piping costs . . . allow flexibility in installation to fit varied unit and piping locations.

Spread Instant Heat on Work Zones

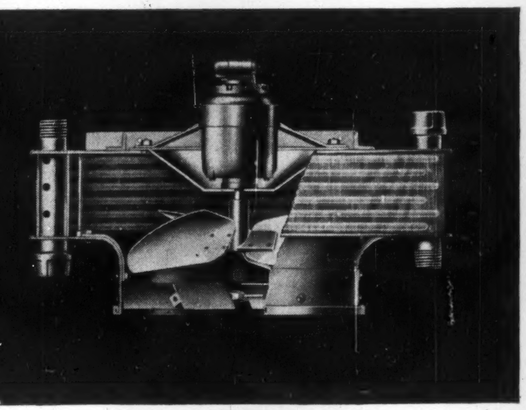
Modern-design Speedheaters slash fuel costs up to 25% when used as complete systems or supplements to existing central systems.

These three Westinghouse Speedheaters provide instant, low-cost heat—*where* and *when* you want it—for applications ranging from spotting heat into small areas, to spreading heat comfortably and efficiently over large work zones. Both dependable and attractive, they are ideal for stores, offices, factories, warehouses—anyplace, in fact, requiring quick, uniform heat at lowest cost.

Westinghouse Speedheaters go to work immediately. Their *instant heat* eliminates fuel loss . . . saves, as proved in installations across the country, up to 25 per cent in fuel costs over old-style heating systems. Available in sizes from 17,800 to 400,000 BTUH, these Speedheaters supplement your present central system for most effective heat coverage . . . or satisfy, through flexible unit selection and placement, your entire heating needs.

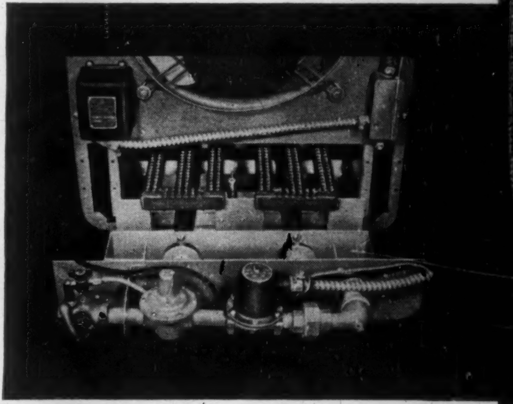
Check on these versatile units today. Call the Westinghouse-Sturtevant representative conveniently located in your area, or write Westinghouse Electric Corporation, Sturtevant Division, Boston 36, Mass.

For specifications, dimensions, performance data, send today for CATALOGS 1521 (Steam—Hot Water) and 1525 (Gas-Fired)



For buildings with high ceilings, Westinghouse Downblast Speedheaters are ideal. Powerful fans and directional vanes project heated air down to work levels, blanketing large areas with effective, economical heat even where equipment and partitions obstruct circulation.

Fully automatic Gas-Fired Speedheaters eliminate need for central heating plants . . . run on low-cost natural, manufactured or LP gas. Units have seal of approval of AGA Testing Laboratories.



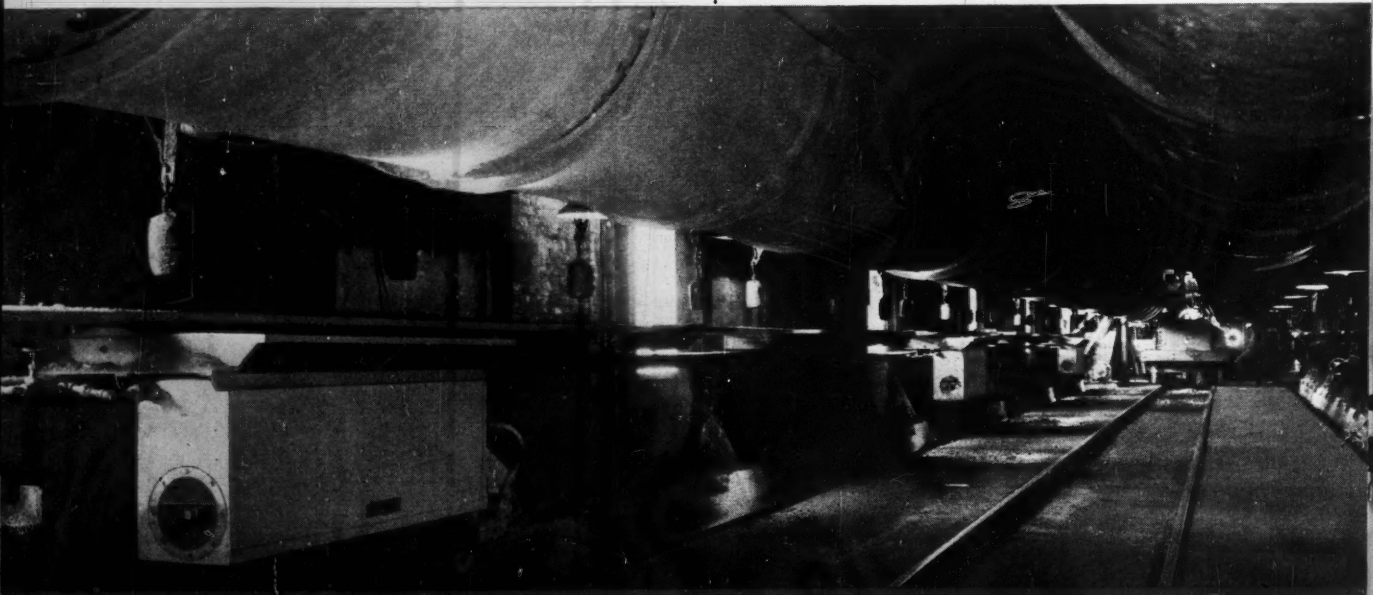
WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

J-804

HEAT-VENTILATE

YOUR PLANT WITH THESE SPACE-SAVER "BUFFALO" UNITS!



LOW OVERHEAD — HIGH EFFICIENCY!

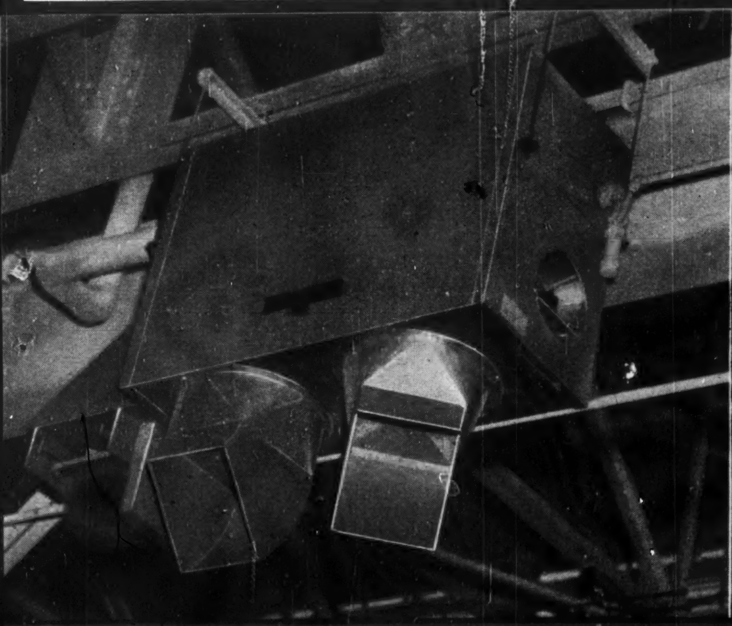
Wall-mounted Lowboys provide plenty of heat even where quarters are cramped. New coil design increases heating surface, with narrower coil section. Coils are non-freeze.

FRESH, CLEAN WARM AIR

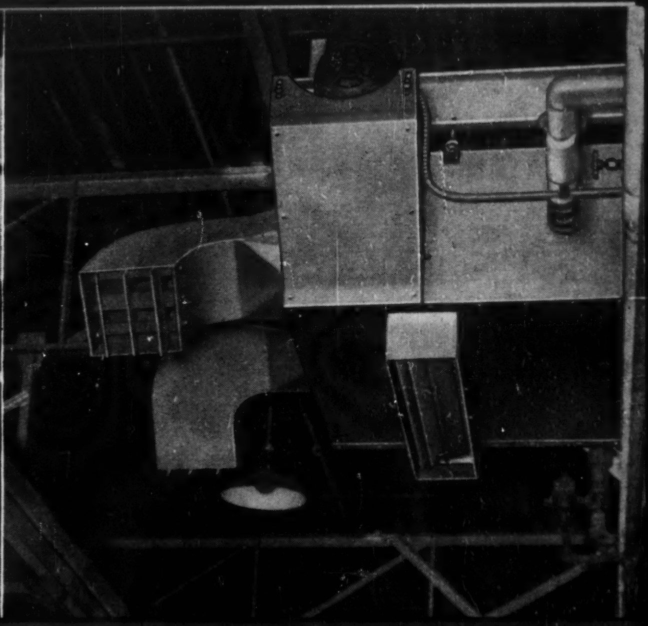
(or cool outside air) is delivered by a compact "Buffalo" Highboy Unit with fresh air filtered intake thru side wall. Bearing bowl at left permits easy external lubrication.

"Buffalo"

PRESSURE BLOWING COOLING



NO FLOOR SPACE REQUIRED with a "Buffalo" Suspended Lowboy Unit Heater. Easily mounted in roof trusses. Spreads abundant, low-cost heat where you need it. Provides ventilation in warm weather.



SWIVEL OUTLETS "AIM" FLOW accurately — a "Buffalo" efficiency feature. Others are "Buffalo" mixed-flow fans with unusually stable performance — standardized parts — lifetime construction.

Let us show you NOW how low-cost and easy it is

to heat and ventilate your plant. Bulletin 3704-A gives all details on the units to handle your heating — ventilating — makeup air problem. Handy chart gives you air diffusion distances for each unit and capacity up to 35,000 cfm.

WRITE FOR BULLETIN 3704-A TODAY!

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171 MORTIMER ST. BUFFALO, NEW YORK
PUBLISHERS OF "FAN ENGINEERING" HANDBOOK
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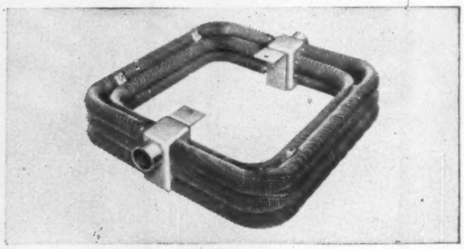
HEATING FORCED DRAFT VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING

Announcing the new American

NEW! Venturafin Vertical Unit Heaters for ceiling-

(58,400 to 560,000 BTU at 2 lbs. steam pressure and 60° F. entering air)

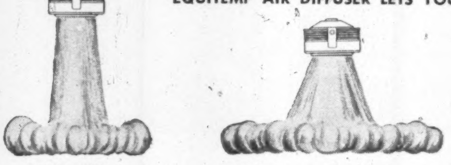
AMERICAN BLOWER



Copper coils for efficient heat transfer

Non-ferrous fins, spirally wound on seamless copper tubing, give efficient, economical heat transfer. Ample spacing between fins cuts clogging from dust, dirt.

EQUITEMP AIR DIFFUSER LETS YOU

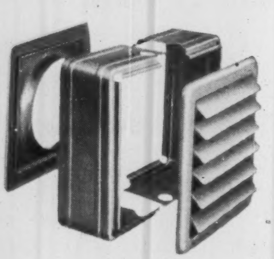


High ceilings **Average ceilings**

NEW! Venturafin Horizontal Unit Heaters for wall-

(18,000 to 357,500 BTU at 2 lbs. steam pressure and 60° F. entering air)

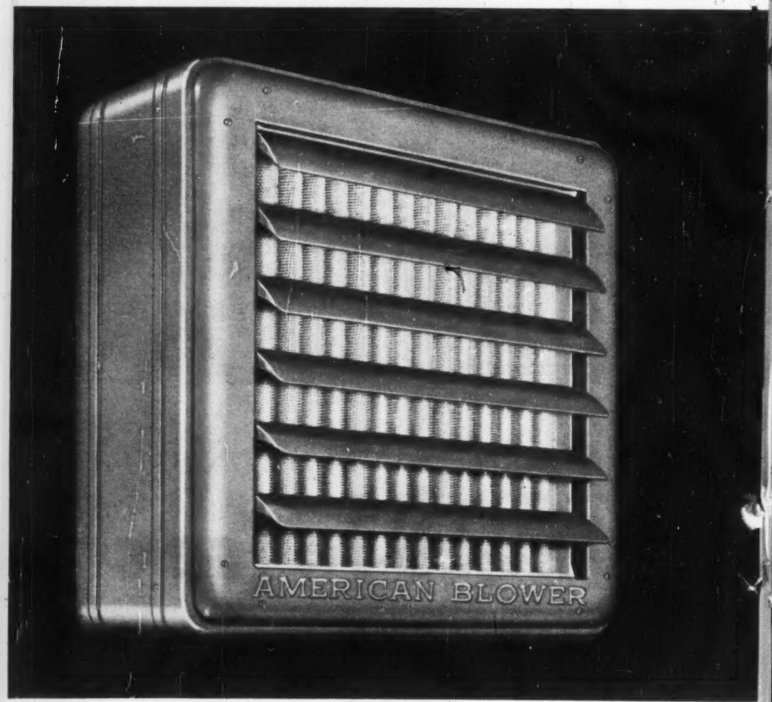
Casings of steel for long life



Steel casings are finished in baked enamel; hardware is cadmium plated. Die-formed horizontal louvers are standard; louvers available in other arrangements for special needs.

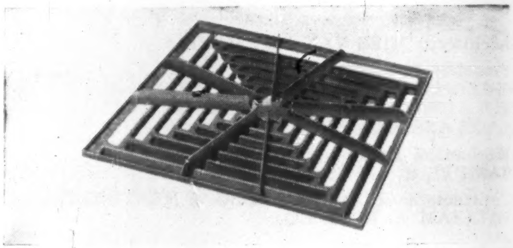
Fans strengthened against de-pitching

Fan wheels are rigidly constructed for maximum efficiency, quiet operation. Blades are of heavy-gauge aluminum, with strengthening beads to eliminate depitching under load.



Blower Venturafin Unit Heaters

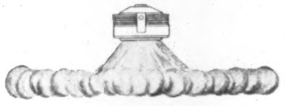
to-floor heating



Equitemp Air Diffuser for uniform warmth

Exclusive Equitemp Air Diffuser extends approximately one inch below heater casing—permits mounting above craneways. Unique design produces temperatures at breathing level that vary less than one degree.

ADJUST THE HEAT TO THE JOB!



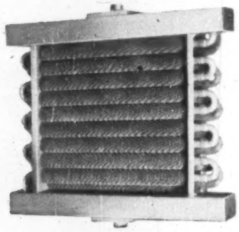
Low ceilings

Indirect heating

To eliminate blasts of air at low mounting heights, simply adjust the vanes on the Equitemp Diffuser. This creates a cone of heated air that mixes with room air; gives even temperatures.

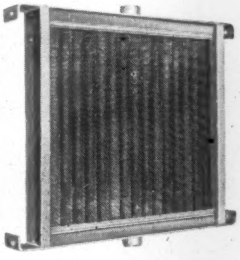
to-wall heating

Serpentine coils for hot water



Serpentine coils—specially designed for hot-water systems—have seamless copper tubes for protection against erosion and corrosion. All coils are free-floating to allow for expansion.

One- or two-row steam coils



Horizontal heaters are furnished with either one- or two-row steam coils for high- or low-pressure systems. Special, multi-fin diffusers are available for unusual air-flow applications.

At last—a horizontal heater that's truly quiet...a vertical heater with heat-flow control! Both in a wide range of sizes!

THEY'RE HERE, now! New Venturafin Unit Heaters—quiet operating, efficient, easy to install . . . yet priced with the lowest!

Horizontal models have separate coil systems for either steam or hot water. Extra heating capacity of exclusive serpentine hot-water coils lets you install smaller units in many cases! Heat transfer is efficient, economical—thanks to seamless copper tubing with non-ferrous fins. And louver panels may be adjusted to deflect heat up or down!

Vertical models feature American Blower's adjustable Equitemp Air Diffuser—lets you tailor heat flow to the job! Anemostat or vane-type diffusers also available.

Casings on Venturafin Unit Heaters are ruggedly constructed of heavy-gauge furniture steel, die formed for perfect fit and freedom from rattles; finished in gleaming, easy-to-clean baked enamel.

Visit your American Blower jobber, today! Inspect the new, lower priced Venturafin Unit Heaters; then try them on your next installation!

AMERICAN BLOWER CORPORATION
DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD.
WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

Serving home and industry: **AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS**

Illinois Institute of Technology, Chicago, uses

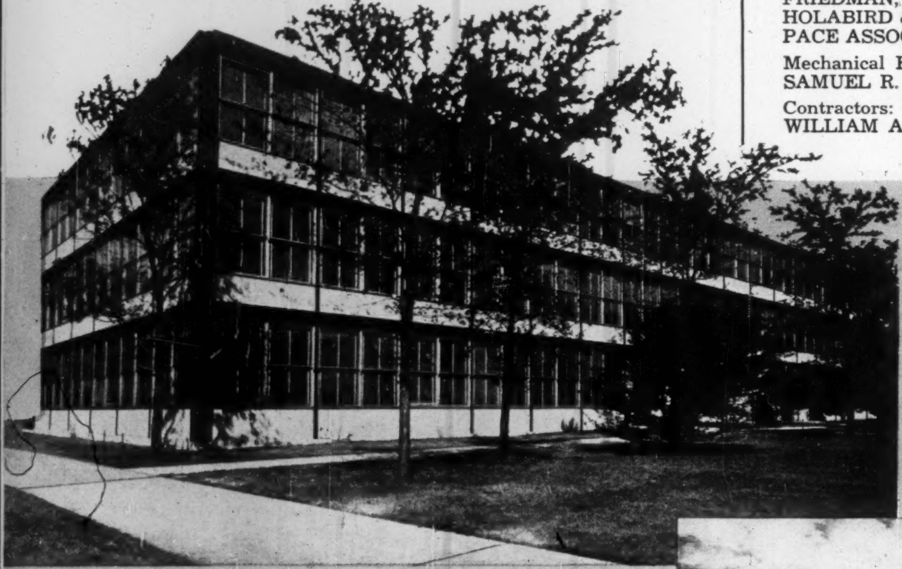
Illinois Tech Buildings Received 1953 Award from A.I.A., Chicago Chapter, "for their simplicity of design and compatability of design to function."

Architect: MIES VAN DER ROHE

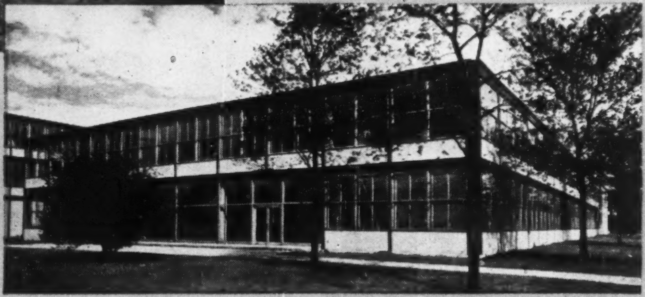
Associate Architects:
FRIEDMAN, ALSCHULER & SINCERE
HOLABIRD & ROOT & BURGEE
PACE ASSOCIATES

Mechanical Engineers: ROBERT E. HATTIS
SAMUEL R. LEWIS & ASSOCIATES

Contractors: ECONOMY PLBG. & HEATING CO.
WILLIAM A. POPE CO.



Left: Chemistry Building • Below: Metallurgical and Chemical Engineering Building



POWERS CONTROL

Since 1891

Below: Carman Hall.
One of three similar apartment buildings. They provide modern living quarters for students and staff. Each apartment has a POWERS Thermostat controlling hot water radiant heating. Ventilation is also POWERS controlled.

POWERS

pneumatic systems of temperature control

to regulate heating systems in these prominent buildings:

Armour Research Laboratory • Chemistry Building
Metallurgical and Chemical Engineering
Institute of Gas Technology
Association of American Railroads Building
Alumni Memorial Hall
Network Calculator Laboratory
Sound Laboratory • Machinery Hall
Carman Hall and two other Apartment Buildings
New Commons Building

"Illinois Institute of Technology is growing to be the best architectural expression of a technical college in the world . . . and perhaps the only really consistent one." — *From Architectural Forum, Nov. 1952.*

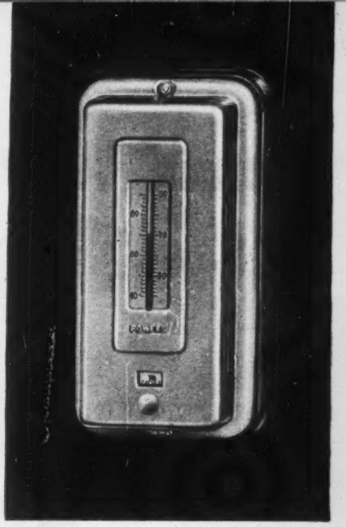
In modern buildings of many famous colleges from coast to coast, such as Massachusetts Institute of Technology, Harvard University, Carnegie Tech, U.C.L.A., and California Institute of Technology, you'll find POWERS pneumatic systems of temperature control. Since 1891 they've been outstanding for their many years of dependable service with a minimum of maintenance.

When you have problems of control for heating and air conditioning systems or industrial processes, call in a POWERS engineer. Experience we have gained in all types of prominent installations should be helpful to you.

THE POWERS REGULATOR CO.

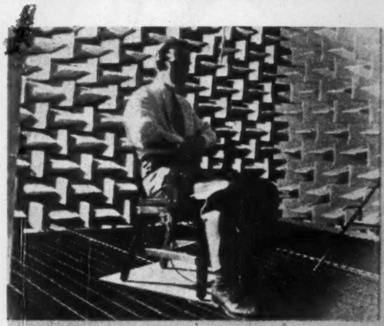
SKOKIE, ILLINOIS
Offices in 60 cities in the U. S. A., Canada and Mexico

(b80)

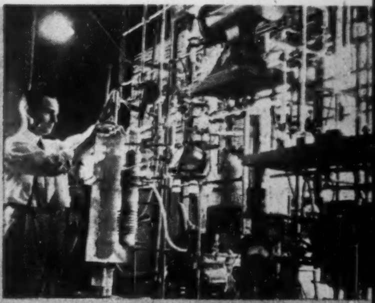


Powers Room Type Thermostat pneumatically regulates heating and air conditioning systems. Users often report over 30 years of accurate dependable service.

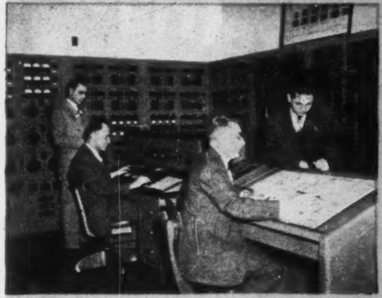
Many other types of Powers Control are used at Illinois Tech: Recording Controllers for Wet and Dry Bulb; Master-Submaster Controls; ACCRITEM Regulators; LIMITEM Thermostats; Powers FLOWRITE diaphragm Valves and Packless Valves for Convectors, Radiant Panel Control, etc.; Powers POWERSTROKE Damper Operators, etc.



Acoustical Research Chamber



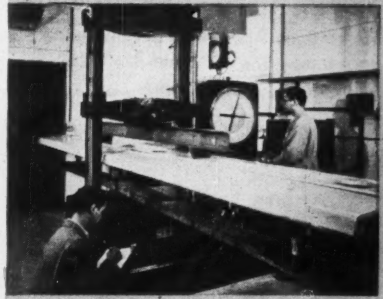
Vacuum Fusion Test Apparatus



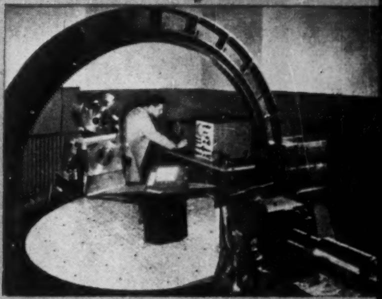
AC Network Calculator

"Research Improves Everybody's Future. It accelerates industrial progress, buttresses national security, and advances technological frontiers. It is a means of harnessing science to serve man's economic ends."
H. A. Leedy, Director of Armour Research Foundation, Illinois Tech, Chicago.

Students, Research Scientists and Engineers do their best work in the comfortable thermal environment provided by a Powers pneumatic system of Temperature Control.



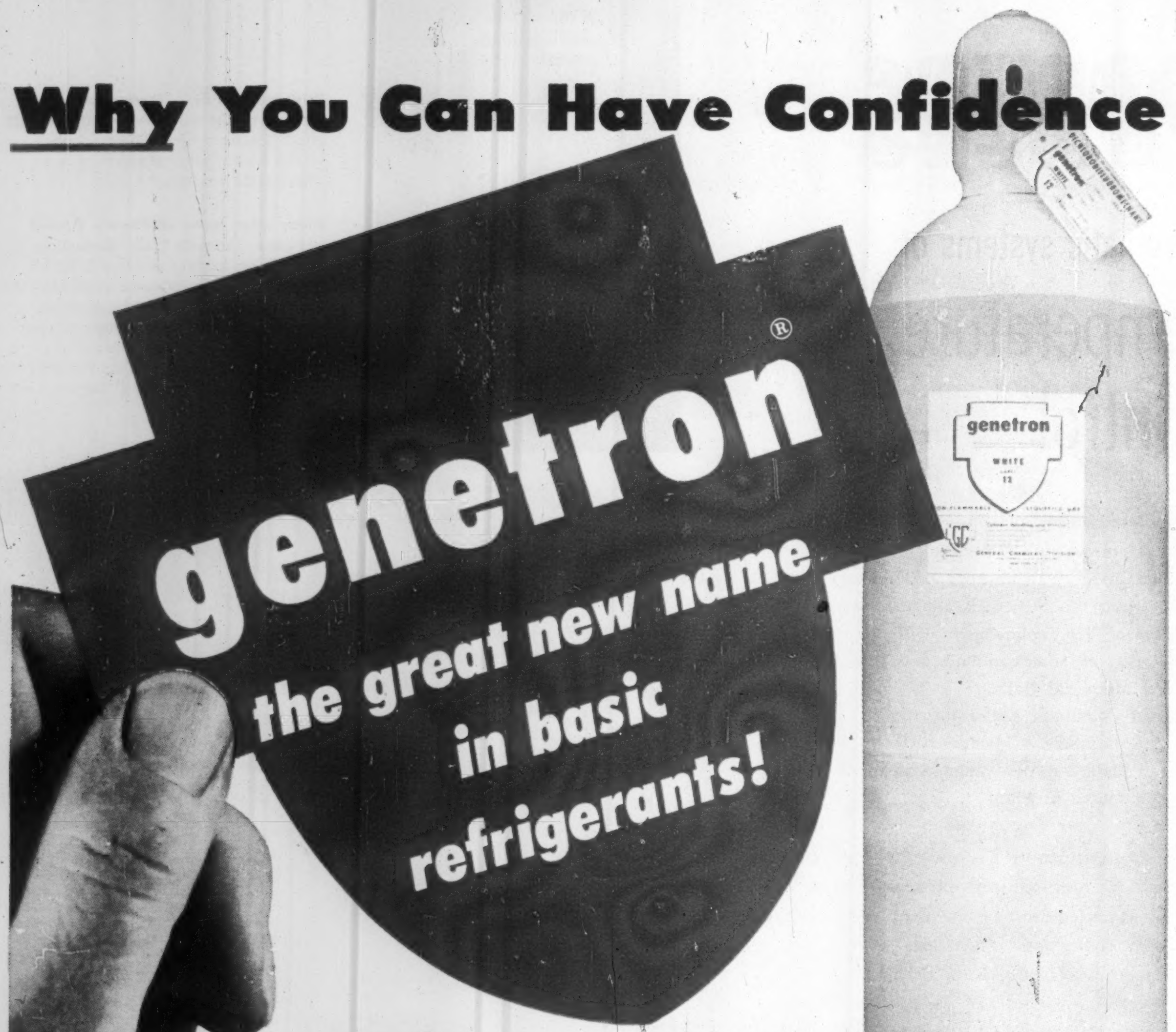
Strength Testing Fluorescent Lighting Unit in Engineering Mechanics Lab.



Roll Test Model for Developing Airplane and Rocket Flight Control Devices

Over 60 years of Automatic Temperature Control

Why You Can Have Confidence

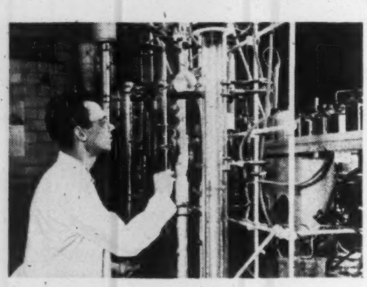


genetron WHITE LABEL-12
DICHLORODIFLUOROMETHANE

genetron ORANGE LABEL-11
TRICHLOROMONOFLUOROMETHANE

In refrigerants, remember the name "Genetron" always identifies General Chemical's great new line of "super-dry" refrigerants. . . . And the label color code always means—

WHITE LABEL=Dichlorodifluoromethane • ORANGE LABEL=Trichloromonofluoromethane



EXTENSIVE RESEARCH

"Genetron" refrigerants are products of General Chemical's extensive, continuous fluorine research program which has produced over 90 fluorine products for science and industry.

SOUND BASIC POSITION

General Chemical is a pioneer and pace-setting leader in the field of fluorine chemicals. Its position is basic and sound—including mines and reserves for necessary raw materials.

when you see this label...

Any time you buy a product from a new source, you naturally want to know more about the manufacturer to make sure he and his products are dependable. That's only smart business . . . and it's certainly doubly important when the product is as basic and vital as the refrigerants you use.

What about General Chemical—the maker of "Genetron" refrigerants?

Serving Behind the Scenes in Your Daily Life

Just this—the steel in your family automobile and refrigerator was quite likely processed with General Chemical's sulfuric acid . . . the water you drink may well have been purified with General's "Alum", just as the clothes you wear and the food you eat probably have been produced with the help of one or a dozen other "G.C." products.

"Basic Chemicals for American Industry"

In other words, General Chemical is one of America's greatest producers of basic industrial and agricultural chemicals . . . and has been since 1899. It supplies every major industry that uses chemicals . . . from petroleum to pharmaceuticals . . . and has served a good part of its customers since they first opened their doors. Its slogan—*Basic Chemicals for American Industry*—typifies the scope and depth of its services.

Backs its Products All The Way

Now—with its large-scale production of "Genetron" organic flourine refrigerants, General Chemical is serving the air conditioning and refrigeration industry in the same sound, steady manner that has earned it the confidence of thousands of customers in so many other fields.

So, whenever you see the "Genetron" label on a refrigerant cylinder or drum—remember that General Chemical is the company behind this great new name in basic refrigerants . . . *and it backs them all the way!*

Available in all standard container sizes:

Genetron WHITE LABEL-12 is shipped in 10-lb., 25-lb., 145-lb., and one-ton (2,000 lbs.) cylinders.

Genetron ORANGE LABEL-11 is shipped in 100-lb., 200-lb. drums, and one-ton (2,000 lbs.) cylinders.

FOR FURTHER INFORMATION . . .

Write or 'phone the nearest General Chemical office listed below. Ask for FREE TECHNICAL SERVICE BULLETIN 11.12A on "Genetron" Refrigerants

Products of

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

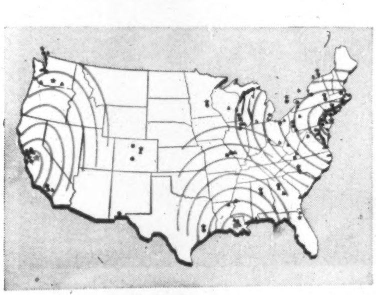
Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo Charlotte • Chicago • Cleveland • Denver • Detroit • Greenville (Miss.) • Houston Jacksonville • Kalamazoo • Los Angeles • Minneapolis • New York • Philadelphia Pittsburgh • Providence • San Francisco • Seattle • St. Louis • Yakima (Wash.)

In Wisconsin: General Chemical Company, Inc., Milwaukee

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

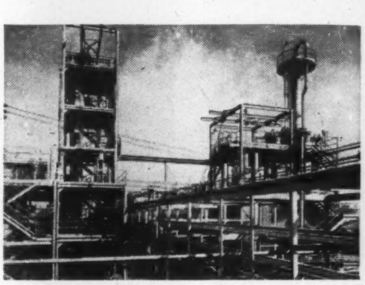
Allied Chemical

America's Foremost Producer of Fluorine Chemicals



NATION-WIDE SERVICE

General Chemical has almost 100 service and supply points throughout the United States and Canada. Production centers for fluorine chemicals are indicated by stars.



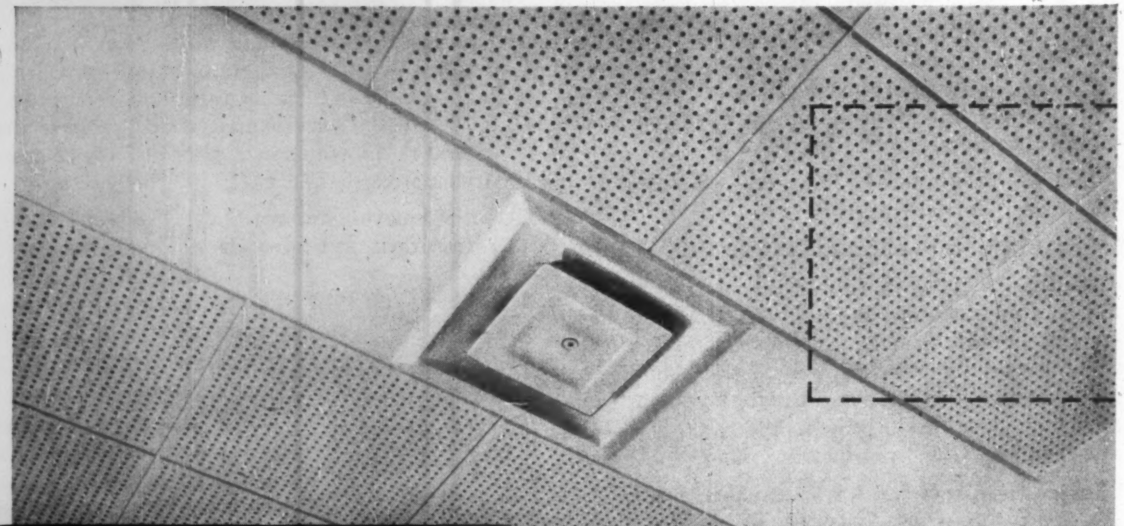
SUPERIOR FACILITIES

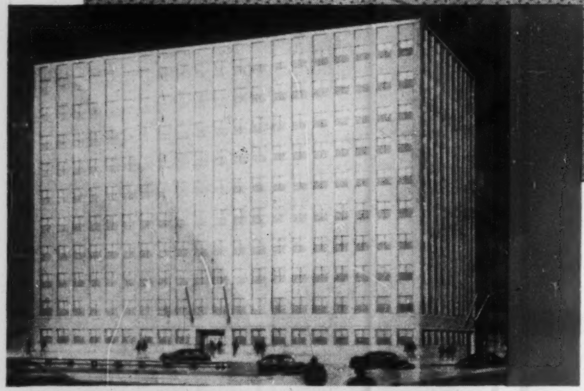
General Chemical's "Genetron" plant at Baton Rouge, Louisiana, is one of the most modern fluorine refrigerant plants in America, employing special new manufacturing processes.

EXACTING PROCESS CONTROL

The extremely low moisture content and high purity of "Genetron" refrigerants is a result of advanced manufacturing methods and unique process control techniques.

Now... made to be integrated

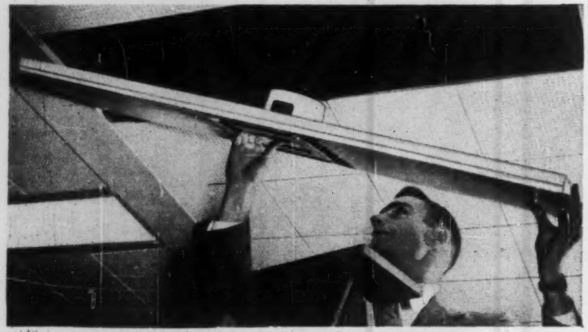




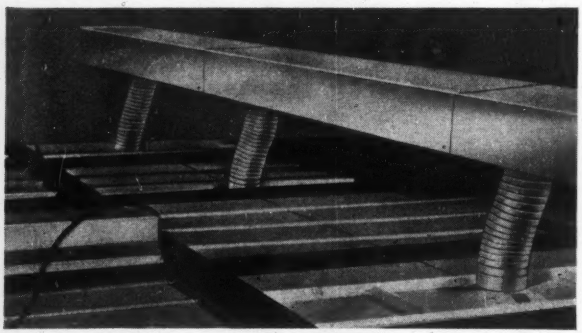
HOLABIRD & ROOT & BURGEE • ARCHITECTS

BASIC BEAUTY of the ceiling is accented by the Kno-Draft Panel Type Air Diffusers, which blend into the ceiling pattern and create a single unified surface that is absolutely level and pleasing to the eye.

SINCLAIR OIL COMPANY'S new modern 12-story building in Chicago. Acoustical ceilings with integral Kno-Draft Panel Type Air Diffusers are used throughout.



EASY TO INSTALL as the acoustical tiles themselves, Kno-Draft panels snap quickly into place. Ducts and flexible connections are readily accessible and connections can be made in a matter of minutes.



FLEXIBILITY of location is a big feature of Kno-Draft Panel Type Air Diffusers. Flexible connections permit diffuser panels to be offset from ducts. This allows partitions, offices, display areas to be relocated without moving ductwork.

with your acoustical ceilings...

kno·draft®

PANEL TYPE

air diffusers

These handsome, efficient Kno-Draft Panel Type Air Diffusers are especially designed for use with suspended acoustical ceilings, and can be moved anywhere on the ceiling to meet changing conditions of occupancy. They benefit everyone —

Architects can specify handsome, low-cost ceilings with completely integrated air diffusers and lighting units.

Consulting engineers have a welcome flexibility in design and avoid the exact calculations imposed by fixed outlets and rigid connections.

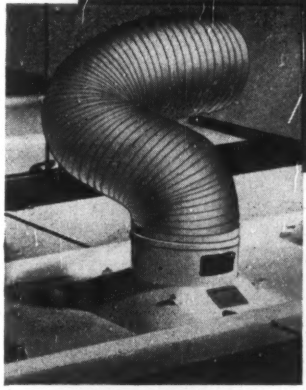
Sheet metal contractors save a lot of installation time and labor. Kno-Draft Panel Type Air Diffusers go up faster than any others.

Building maintenance engineers always have quick access to the concealed service lines, air ducts and wiring.

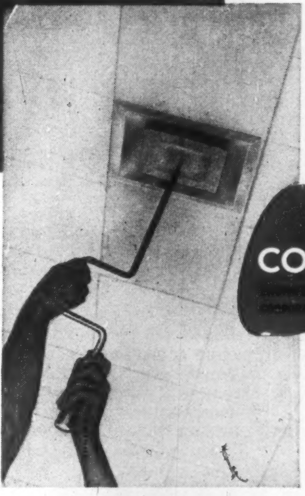
Owners enjoy the comfort of perfect air diffusion and can relocate diffusers and lighting units easily to meet demand changes.

Kno-Draft Panel Type Air Diffusers are available in 12" x 24" and 12" x 48" panels and three outlet sizes to handle up to 175 c.f.m. Diffusers can be easily adjusted *after installation* to regulate air volume without affecting air velocity which remains constant. No air "spoilage" at *any* damper position.

For complete specifications and engineering data, mail the coupon today. Connor Engineering Corporation, Danbury, Connecticut.



COMPLEX BENDS to connect diffusers to ducts may sometimes be necessary. They can be easily made by taking off from side of duct. Special connectors are practically indestructible, will not support combustion, and maintain a uniform interior cross section at all times. They do not contribute to noise level.



DAMPER ADJUSTMENT to control air volume can be made quickly and easily *after installation*. Exclusive Kno-Draft sleeve type damper regulates volume without affecting air velocity.

CONNOR

kno·draft®

panel type air diffusers

see our catalog in
ARCHITECTURAL FILE
or write for copy

CONNOR ENGINEERING CORPORATION
Dept. G-74, Danbury, Connecticut

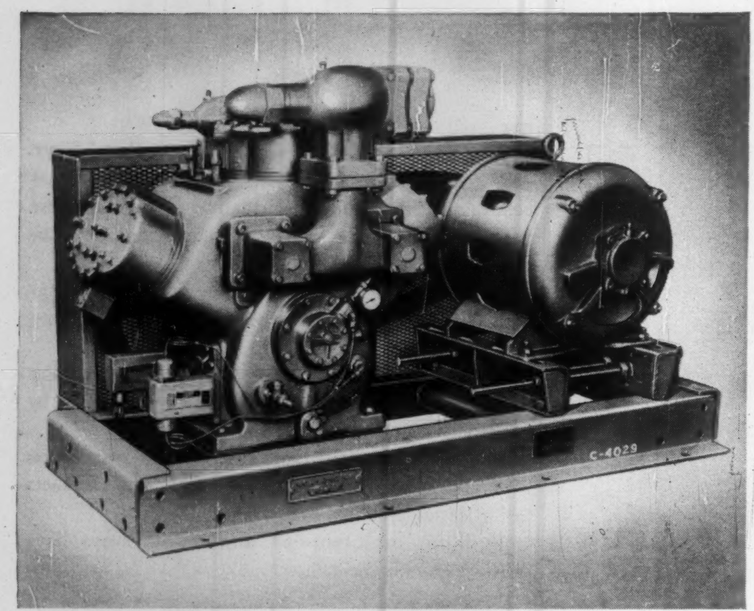
Please send me, without obligation, full information on your new Kno-Draft Panel Type Air Diffusers.

Name______________________________

Company____________________________

Address_____________________________

The whole industry's talking about Worthington's new Freon compressor



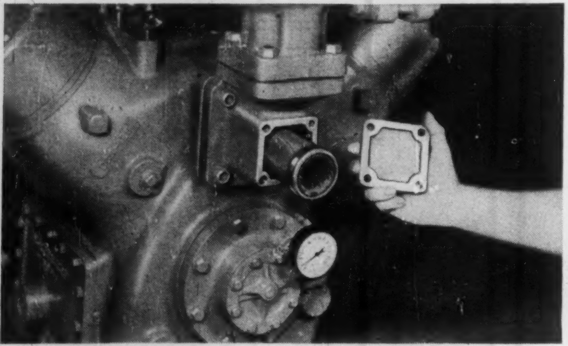
TRIM, STURDY CONSTRUCTION marks this 4JF6 compressor unit — 50-60 hp, six cylinder W-type compressor. The complete compact unit consists of fabricated steel base, compressor with valves, gauges and safety controls, drive and safety guard. Designed to operate in conjunction with Worthington evaporative condensers in localities where city water is scarce or high in cost. Also available with shell and tube condenser. Complete range from 3-150 hp.

"The high capacity unit we've been waiting for!"

"Greater operating efficiency!"

"There's nothing else like it!"

And every comment you hear is true! The refrigeration compressor is the most vital element of any air conditioning or refrigeration system. That's why Worthington spent years in developing the new "J" Freon compressor. That's why Worthington invested over a million dollars in compressor research. *And that's why you can't find its match in any other unit.* Only a few features of the new "J" Freon compressor are highlighted here — get the full story by contacting your nearest Worthington district office or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.4.33, Harrison, New Jersey.



EASY REMOVAL of suction gas strainer for cleaning is made possible by new suction manifold design. No pipes, valves or other parts need to be dismantled in order to get at the strainer. And Worthington's new electric unloaders automatically balance power consumption with load requirements.

LORD & TAYLOR'S new West Hartford, Conn., store depends on Worthington to provide comfortable air conditioning for its customers. Two 150 hp "J" compressors and two evaporative condensers make up the highly efficient Worthington air conditioning team at this modern store.

A.4.33

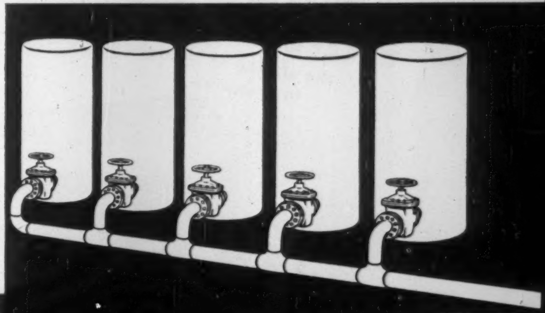
WORTHINGTON

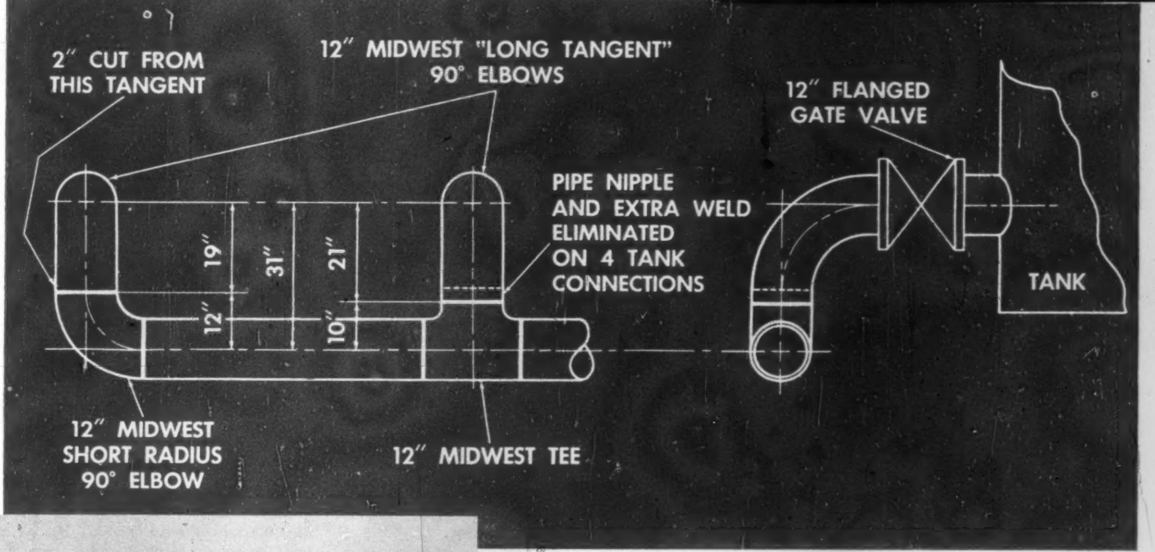
CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

MIDWEST "LONG TANGENT" ELBOWS

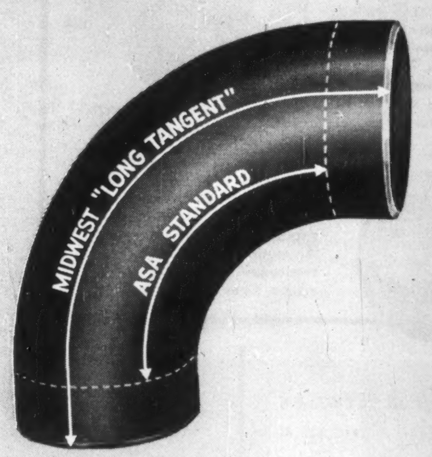
SAVED $156.20

On This Welding Piping




2" CUT FROM THIS TANGENT
12" MIDWEST "LONG TANGENT" 90° ELBOWS
12" FLANGED GATE VALVE
PIPE NIPPLE AND EXTRA WELD ELIMINATED ON 4 TANK CONNECTIONS
19"
31"
21"
12"
10"
TANK
12" MIDWEST SHORT RADIUS 90° ELBOW
12" MIDWEST TEE

MIDWEST "LONG TANGENT" ELBOWS COST NO MORE THAN OTHER ELBOWS


MIDWEST "LONG TANGENT"
ASA STANDARD

The Problem:

To connect the five tanks shown in the sketch at top to a common 12" header.

The Difficulty:

The center-to-outlet dimension of the 4—12" tees is only 10", while the shortest elbow available measures 12" center-to-end. Thus, if standard long radius elbows are used next to the five tank valves, four short nipples and four extra 12" welds would be required.

The Solution:

By using Midwest "Long Tangent" elbows as shown in the blueprint, the expense of the four extra nipples and welds was eliminated at the cost of just one cut! The actual net savings made by "Long Tangent" elbows on this job was $156.20.

Remember—Midwest "Long Tangent" elbows cost no more than regular elbows! For further information, write for Catalog 54.

MIDWEST PIPING COMPANY, INC.

Main Office, 1450 South Second St., St. Louis 4, Missouri

PLANTS: ST. LOUIS, PASSAIC, LOS ANGELES, and BOSTON

SALES OFFICES: NEW YORK 7—50 CHURCH ST. • LOS ANGELES 33—520 ANDERSON ST.
BOSTON 27—426 FIRST ST. • CHICAGO 3—79 WEST MONROE ST.
TULSA 3—224 WRIGHT BLDG. • HOUSTON 2—1213 CAPITOL AVE.

6820

MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS

Wagner®
ELECTRIC MOTORS
. . . the choice of leaders in industry

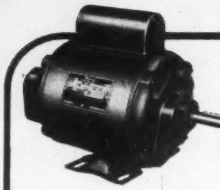
for single-phase motor applications Wagner Type RK is the Right Kind of motor to use . . .

REFRIGERATORS
AIR CONDITIONERS
MOTOR DRIVEN TOOLS
WATER PUMPS

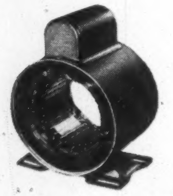
Wagner capacitor-start induction motors are the *right kind* of motors to use for most single-phase applications. They have become first choice of many leading manufacturers of air conditioners, refrigerators, freezers, water pumps, and motor-driven tools, and are used in many other similar fractional or integral horsepower applications.

These motors offer low maintenance cost—only a minimum of servicing is required—and they give many years of reliable service with unusual freedom from vibration and noise.

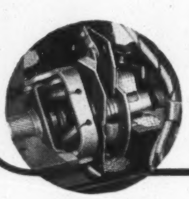
Pictured above is the Wagner Type RK, resilient-mounted capacitor-start induction motor in the new 56 frame that is used for ⅓, ½ and ¾ hp ratings. Smaller fractional ratings, and integral sizes from 1 through 5 hp, are also available.



Wagner rigid base Type RK motor, in the new 56 frame size. The formed steel base is securely welded to the rolled steel frame to produce a strong, rigid mount that will not get out of alignment.



Frames for these motors are made of thick rolled steel, with machined beads which accurately position the end plates. The frames have no openings, and are treated inside and out to prevent rusting.



These motors are equipped with the Wagner quick-break switch that disconnects the starting winding and capacitor from the line when the motor approaches operating speed. It operates over a million times without trouble.

Wagner Electric Corporation
EST. WEC 1891

WAGNER ELECTRIC CORPORATION
6370 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

M54-15

THESE

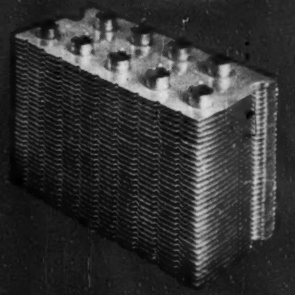
YOUNG

ENGINEERED
HEATING COILS
FEATURE . . .

- high efficiency cores
- long life
- guaranteed ratings

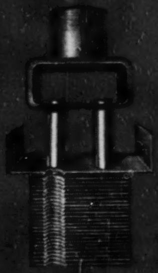
PRECISION EXTRUDED FINS

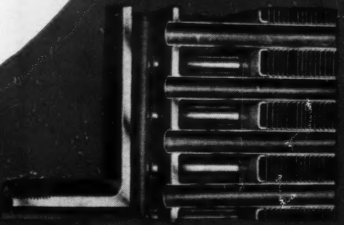
Young fin and tube construction incorporates high strength red brass tubes staggered for increased efficiency with standard aluminum or special copper fins. Admiralty or heavy-wall tubes furnished for specific requirements.



MECHANICALLY EXPANDED TUBE-TO-FIN COLLAR BOND

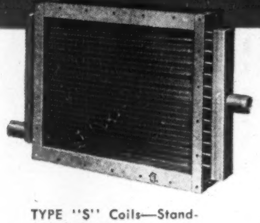
Young Coils feature double-walled continuous-metal transfer surface secured by mechanically expanding tube to the fin collar for maximum capacity, testing to full rated standards.



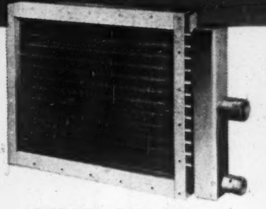


PERMANENT, LEAK-PROOF TUBE-TO-HEADER CONSTRUCTION

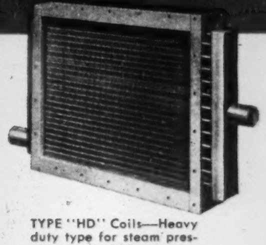
Heavy gauge hot-rolled steel headers with brazed-in tube ends provides a leakproof joint. End support plate permits free expansion and contraction movements of tubes while in service.



TYPE "S" Coils—Standard for steam or water service. Steam pressures from 2 to 150 psi; temperatures to 400° F.



TYPE "SD" Coils—Steam distributing tube type, recommended maximum operating pressure—25 psi.



TYPE "HD" Coils—Heavy duty type for steam pressures up to 300 psi; temperatures to 500° F.

For further details see the yellow pages of your telephone book for nearest Young Sales Representative, or write for free Catalog No. 4553.

Heating, Cooling, Air Conditioning Products for Home and Industry.

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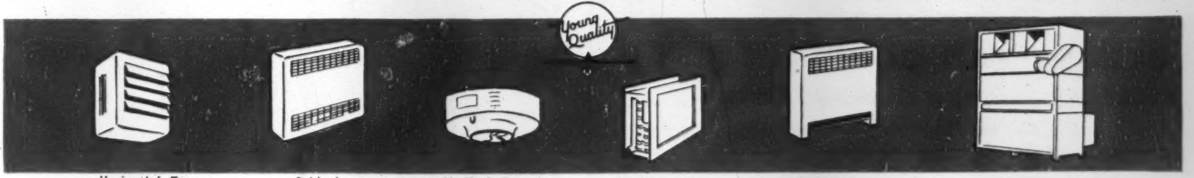
Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Application.

YOUNG RADIATOR COMPANY **DEPT. 514G, RACINE, WISCONSIN • PLANTS AT RACINE, WIS. AND MATTOON, ILL.**



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'YAC' Air Conditioning Units

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World-changing, future-shaping developments are being made in America's mastery of the air. In many defense installations throughout the country, Utility blowers contribute to this progress by conquering oppressive heat and humidity—as in the important U.S. Air Force Guided Missile School at Fort Bliss, Texas.

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

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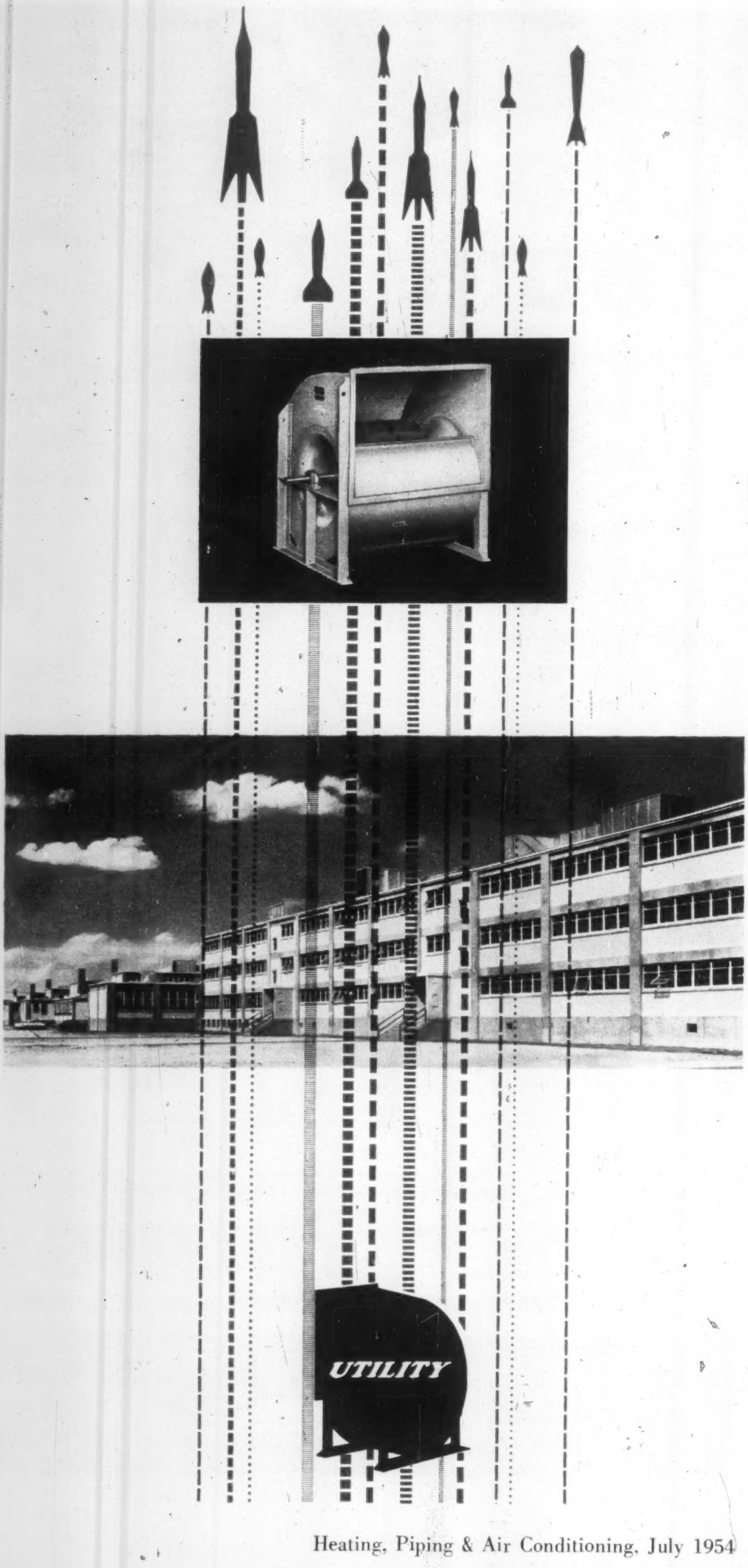

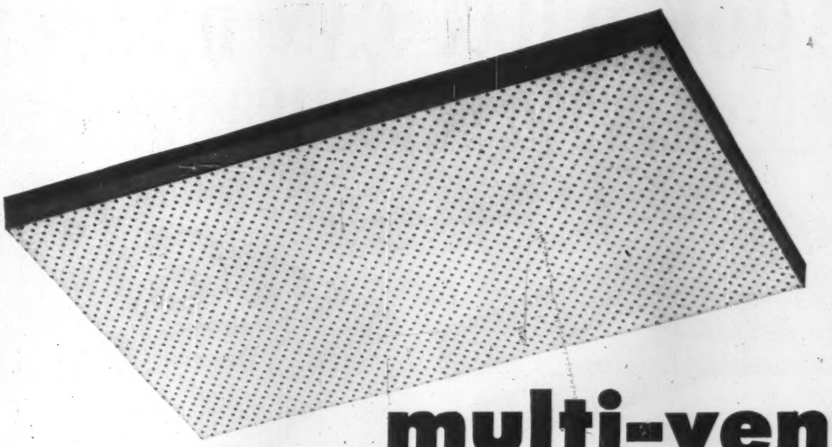

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. . . for heating, ventilating and air conditioning

Specified where *true comfort* . . . or *accurate control* of air movement, temperature and humidity are demanded.

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True Comfort: Flush or completely concealed in the ceiling, distributing air at low velocities by gentle pressure displacement, Multi-Vent provides truly sightless, soundless, imperceptible air-conditioned comfort unmatched by any other diffuser.

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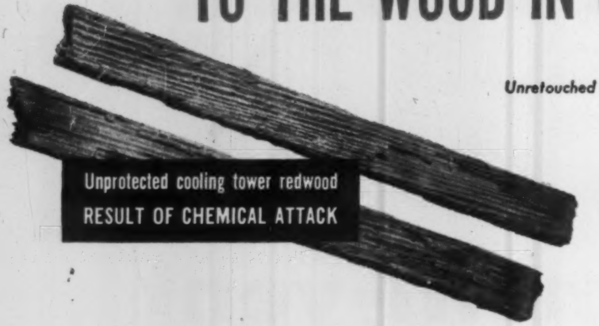
ELECTRICAL CONDUIT FITTINGS • INDUSTRIAL LIGHTING FIXTURES • STEAM TURBINES

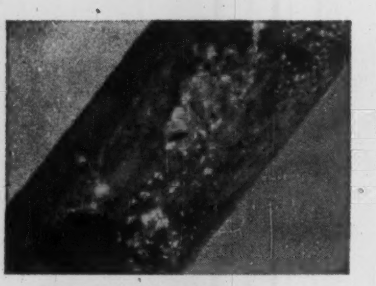
LOOK WHAT CAN HAPPEN TO THE WOOD IN COOLING TOWERS


Unprotected cooling tower redwood
RESULT OF CHEMICAL ATTACK

Unretouched photographs

Unprotected cooling tower redwood
RESULT OF FUNGUS ATTACK

PRESSURE CREOSOTING ADDS YEARS OF LIFE TO HALSTEAD & MITCHELL COOLING TOWERS


FUNGUS ROTTED UNPROTECTED DECKING

Unretouched photographs

CLEAN PRESSURE-CREOSOTED DECKING

Examine these unretouched photographs carefully. Constantly wetted wood decking in a cooling tower is subject to immediate attack by fungus and marine parasites. It is also subject to chemical deterioration from acids in water. All wood used in Halstead & Mitchell Cooling Towers is protected against these twin enemies.

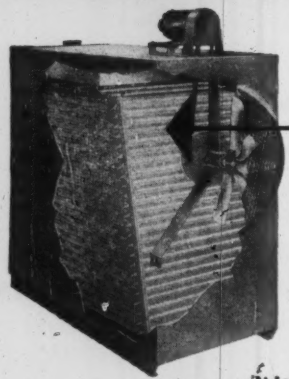
WHY PRESSURE CREOSOTING?

Creosote . . . *with 162 elements toxic to fungus growth and parasites* . . . also makes wood more resistant to chemical attack. Deep penetration of the wood by Koppers Pressure-Creosoting gives the longest possible wetted decking life. Therefore, all Halstead & Mitchell Cooling Tower decks are Pressure-Creosoted, and are guaranteed against rotting due to fungus growth . . . for 20 years!

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE against rotting by fungus attack



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Sheet-Steel Cabinets,
5-times protected
Stainless Steel Fans and Shafts
Weather Shielding
Everdur Bolts for ease of
disassembly at any time.

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FOR COPPER-TO-COPPER

Use these Fast Heating-Easy Soldering

O-B VALVES

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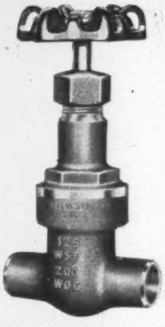
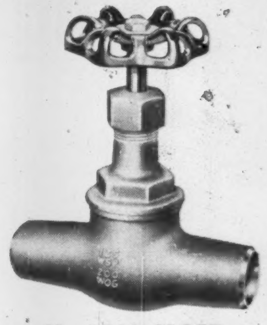
Non-Rising Stem
125 lbs. WSP — 200 lbs WOG
Flexitite Disc®

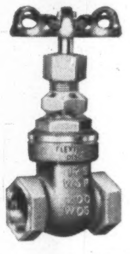


No. 2900 GATE
Rising Stem
125 lbs. WSP — 200 lbs. WOG
Flexitite Disc



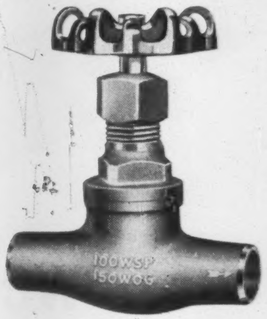
No. 1601 GLOBE
125 lbs. WSP — 200 lbs. WOG
Composition Disc. Also available
in Angle, Swing Check.

With Braze-Type Ends
for Type-B Tubing



No. 6500 GATE
Non-Rising Stem
125 lbs. WSP — 200 lbs. WOG
Flexitite Disc. Also available in
Swing Check.

No. 2400 GATE
Non-Rising Stem
100 lbs. WSP — 150 lbs WOG
Flexitite Disc. Also available
with Drain.



No. 601 GLOBE
100 lbs. WSP — 150 lbs. WOG
Composition Disc
Also available in Angle, or
with Drain.

Ohio Brass Valves

BRONZE GLOBES, ANGLES, GATES AND CHECKS FOR INDUSTRIAL AND DOMESTIC SERVICE

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HEATING AND COOLING DIVISION
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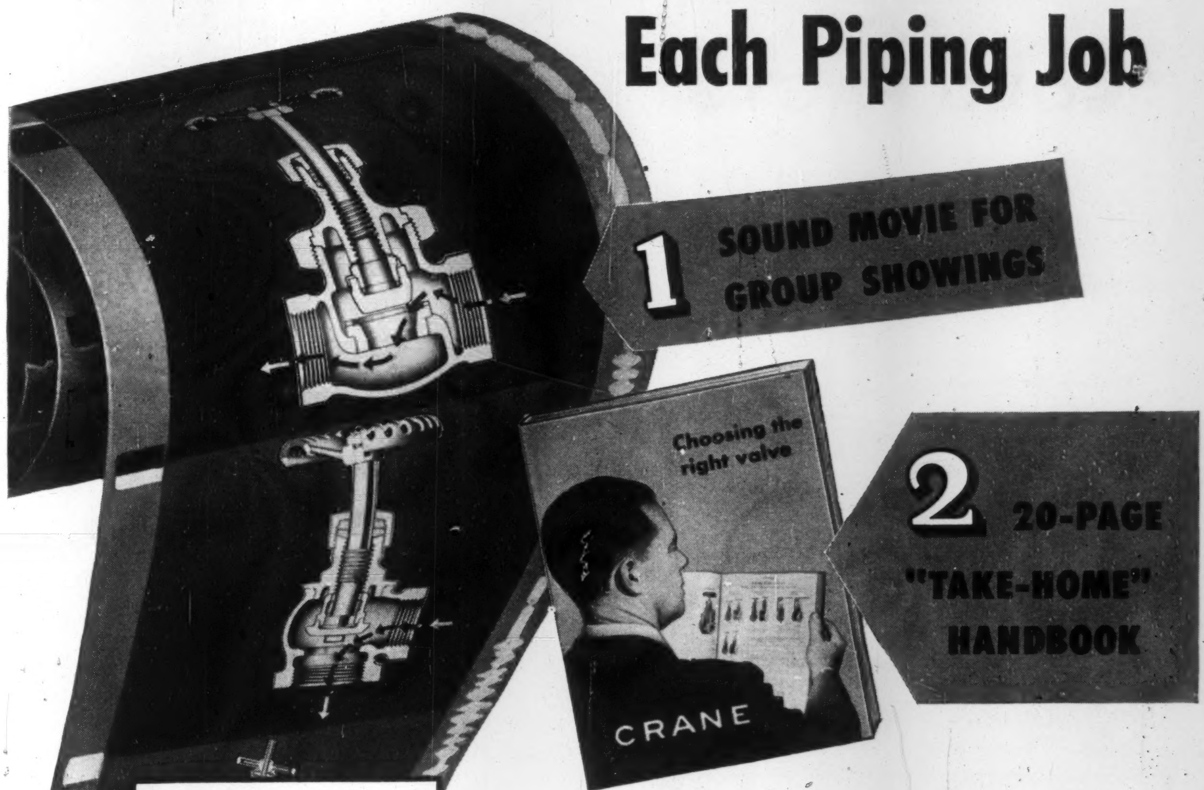
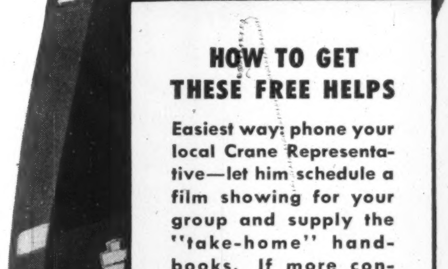
2 New Services from Crane

How to Choose the Right Valve for Each Piping Job


1 SOUND MOVIE FOR GROUP SHOWINGS
Choosing the right valve
CRANE
2 20-PAGE "TAKE-HOME" HANDBOOK



HOW TO GET THESE FREE HELPS

Easiest way: phone your local Crane Representative—let him schedule a film showing for your group and supply the "take-home" handbooks. If more convenient, just drop a line to the address below.

Men responsible for specification, operation, and maintenance of industrial piping systems will get a real "refresher" from these new Crane customer services. Both film and handbook deal with the common problems of matching up valve characteristics and specific flow control needs for the most efficient result.

Following a review of basic valve types—gate, globe, angle, and check—variations in design of functional parts, and the effects on serviceability are discussed. All vital elements—disc and seating—disc-stem connection, bonnet joint, stem operation, etc., are covered. The motion picture stimulates high interest by developing a hypothetical case involving strong differences of opinion on valve selection. The manual—intended for distribution at film showings or for independent use—provides a lasting reference.

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CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
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VALVES • FITTINGS • PIPE • PLUMBING • HEATING

COLD FACTS

You want *dependable* refrigeration. Then depend on Pritchard heavy-duty cooling towers! Why? Because every Pritchard tower is guaranteed to meet your exacting refrigeration or comfort cooling requirements. Pritchard cooling towers are adequately sized, accurately engineered and carefully constructed. Next time you want the right answer to your cooling problems, contact Pritchard—a founder member of the Cooling Tower Institute.

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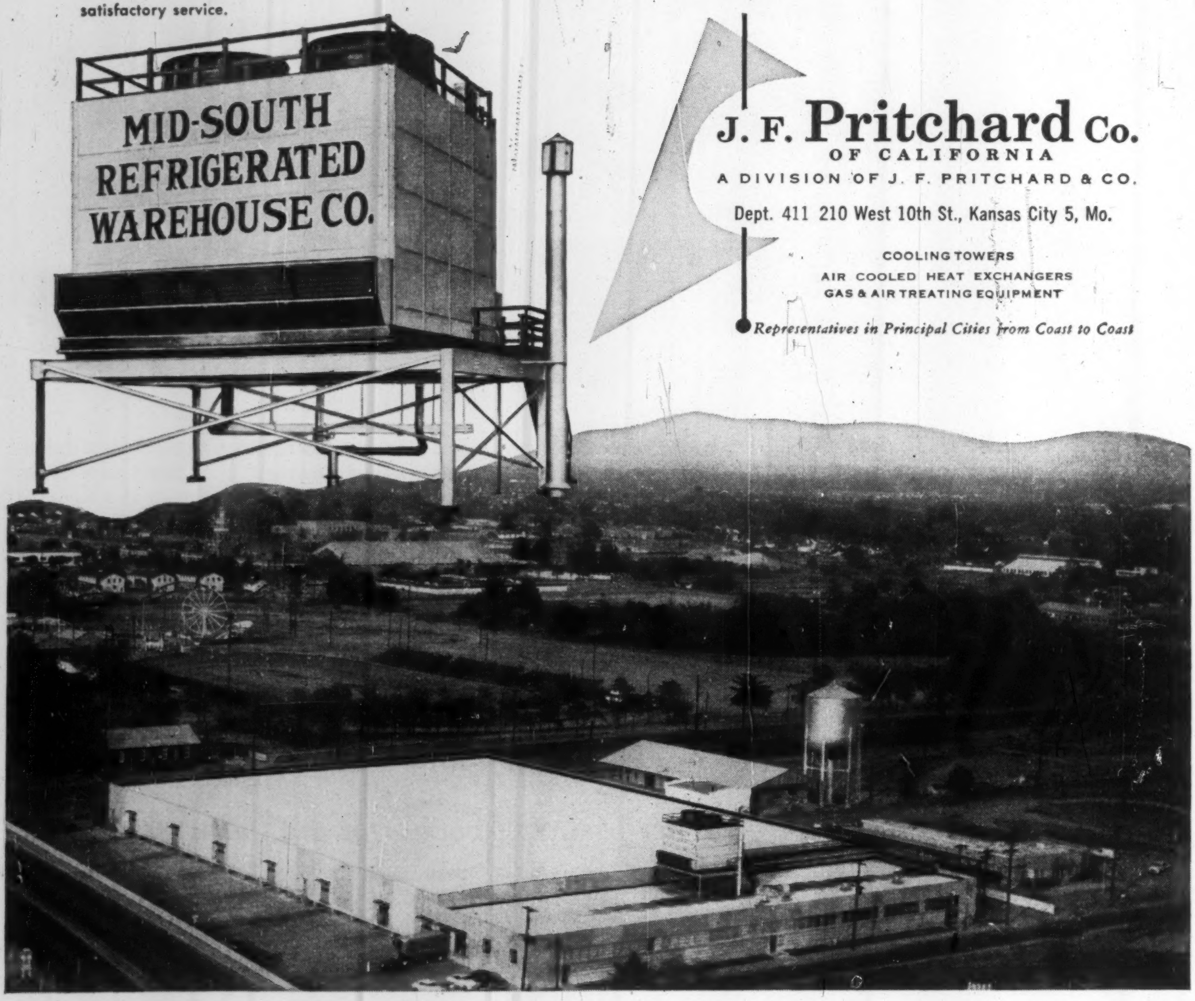
Pritchard-built for continuous, satisfactory service.



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OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
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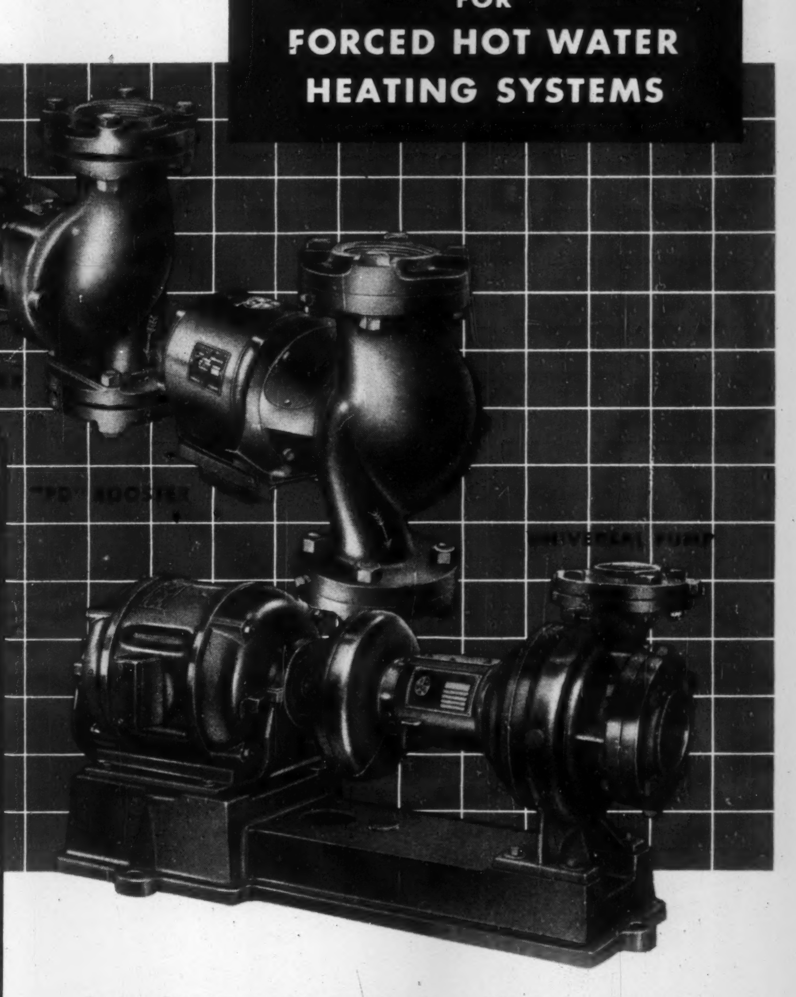
COOLING TOWERS
AIR COOLED HEAT EXCHANGERS
GAS & AIR TREATING EQUIPMENT

Representatives in Principal Cities from Coast to Coast

DESIGNED SPECIFICALLY
FOR
FORCED HOT WATER
HEATING SYSTEMS



QUIET!

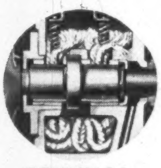
These design features will show you why B & G Pumps have an outstanding record for years of quiet, failure-proof performance.

SEAL

Leak-proof! Made of extremely hard material for long life.

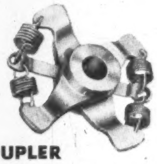
SHAFT

Special alloy steel—oversized! Integral heat-treated collar prevents end-thrust—prolongs seal and motor bearing life.



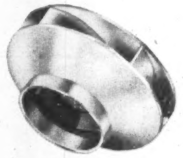
BEARINGS

Extra-long, bronze sleeve bearings are kept in a continuous bath of oil.



COUPLER

Spring-type, flexible coupler dampens noise.



IMPELLER

True centrifugal design, balanced for smooth, vibrationless operation.

A complete range of capacities for residences, apartment buildings, institutions, commercial and industrial buildings

Mere ability to meet a capacity and head requirement does not necessarily qualify a centrifugal pump for heating system application. Unless *quiet operation* is a built-in feature, the pump may be a potential source of trouble.

B & G Boosters and Universal Pumps are designed and built specifically to satisfy this prime requirement of forced hot water heating systems. In every detail they are constructed to assure *quiet operation... trouble-free performance... long life*. B & G Pumps have consistently proved their efficiency and dependability—thousands have been in operation for many years without need for service.

Bronze Boosters for service water installations

Where service water is to be circulated, operating conditions make necessary an all-bronze pump. For this purpose, all sizes of B & G Boosters are available as corrosion-resistant bronze units.

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Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

A60
59
CENTURY
A 94

"THEY HANG FROM ELEPHANT TRUNKS"

The ceiling of Studio 41, in the initial $8-million unit of Columbia Broadcasting System's Television City, Hollywood, measures approximately 35 feet from the floor.

Flexible, telescopic tubes dangling from among the complex maze of cables, lights and gadgets are called "Elephant Trunks". They can be moved independently within an eight foot radius and can be lowered to within 14 feet from, or raised to 28 feet above the floor. Twenty-five such "Elephant Trunks" are installed in each of four studios. Attached to the lower ends of the 100 "Elephant Trunks", are box-like apparatus equipped on four sides with Air-Factor LCF Sidewall Diffusers.

Controlled, conditioned air is projected through the diffusers in four directions from a desired number of "Elephant Trunks". This is necessary to reach and maintain design conditions during times when programs are being telecast with maximum lighting and occupancy loads present.

The selection of correctly designed diffusers, engineered to accomplished the complete air 'diffusion' and directional control necessary for an effective air conditioning system, required a careful screening of many makes. It is significant that the final choice focused on Air-Factor's LCF (Laminar Counter-Flow Series) sidewall types.

TELEVISION CITY, COLUMBIA BROADCASTING SYSTEM
Pereira and Luckman, Architects and Engineers
Wm. Simpson Construction Co., General Contractor
Kilpatrick & Co., Air Conditioning Contractor

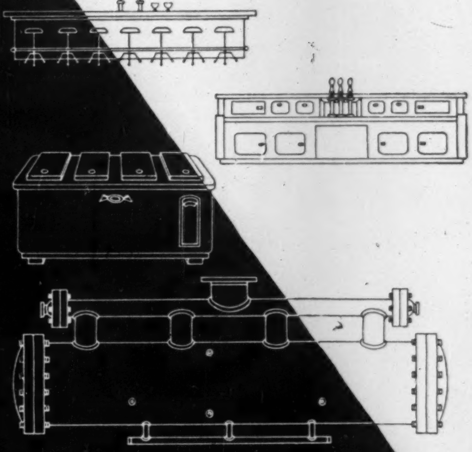
AIR FACTORS Inc.

MONROVIA, CALIFORNIA

AIR DISTRIBUTION
AIR CONTROL

keep your coolers from busting

TYPE 760
TYPE 435
TYPE EPR



prevent freeze-up with ALCO

EVAPORATOR
PRESSURE
REGULATORS

They hold evaporator pressures to a predetermined point when the load changes. Available for any size water cooler—from drinking fountains to large industrial installations.

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for service
for life

SEE YOUR ALCO WHOLESALER

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Large Capacity

SERIES 95

PRESSURE REGULATOR

For steam, air, gas, oil, water or other fluid. Sizes ¼", ⅜", ½", ¾", 1". Outlet pressures from 2 to 30 psi; 15 to 150 psi. Easily installed—no external control lines.

Bulletin C-95 illustrates and describes new internal construction features which give higher capacity and close regulation. Write for your copy today.

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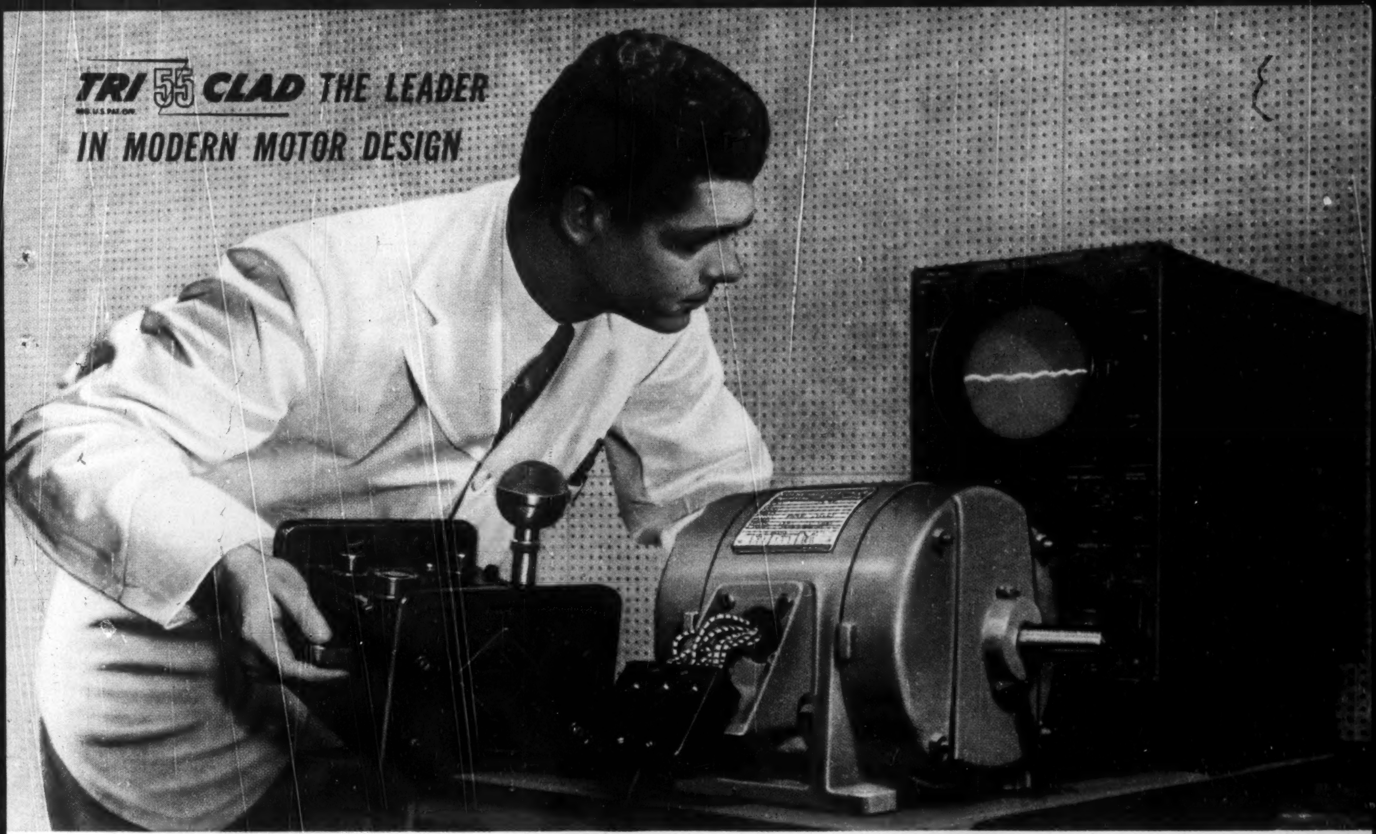
LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL


TRI 55 CLAD THE LEADER
REG. U.S. PAT. OFF.
IN MODERN MOTOR DESIGN

Sound-room tests prove TRI 55 CLAD motors operate at greatly reduced noise level!

REG. U.S. PAT. OFF.

Here's the new motor engineered and built for the fast growing air conditioning industry. It's the quieter, more compact G-E Tri/Clad '55' motor, in ratings from 1 to 30 hp a-c.

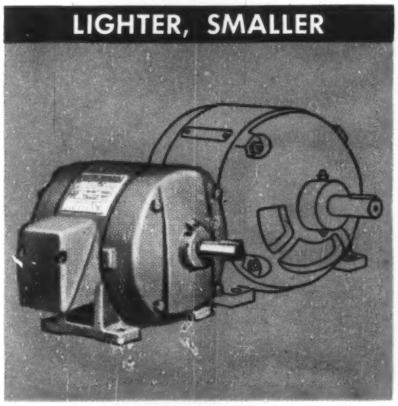
To reduce noise, G. E. engineers developed a new concept—a sonant motor—a motor that sounds pleasing to the ear. They studied, and then reduced, the causes of motor noise—bearing rattle, magnetic hum, and windage. Sound room tests prove the Tri/Clad '55' is sonant, runs quieter.

In addition, the modern looking Tri/Clad '55' motor is lighter and smaller—saves weight, saves space.

Try this new motor. See for yourself how the Tri/Clad '55' can help reduce noise and save space in your own equipment. Contact your G-E Apparatus Sales Office or G-E Motor Supplier today. For bulletins, write General Electric Co., Section 648-12, Schenectady 5, New York.

Progress is our most important product

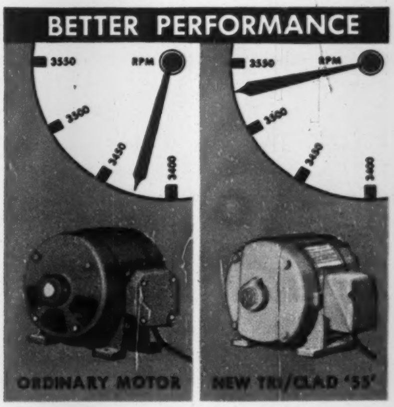
GENERAL ELECTRIC


LIGHTER, SMALLER

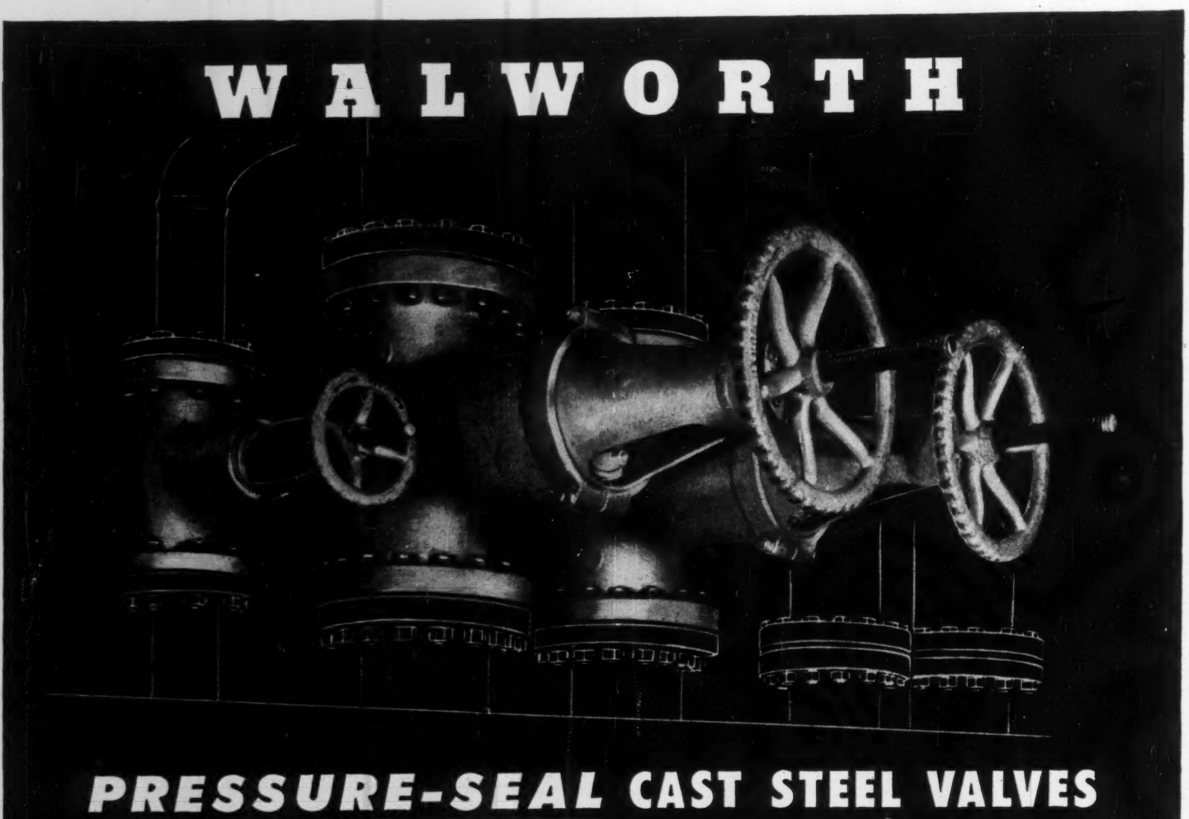
MORE COMPACT MOTOR means more horsepower per pound—saves space, weight—is easier to handle.

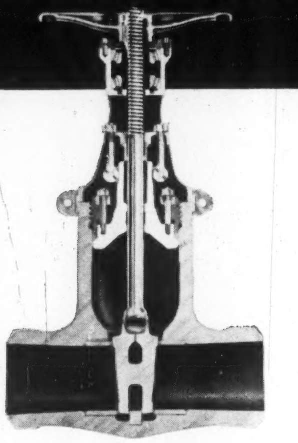
BETTER INSULATION SYSTEM

SILICONE RESIN COATING on stator plus stronger polyester-film slot and phase insulation increase electrical life.


BETTER PERFORMANCE
3550
RPM
3500
3450
3400
3550
RPM
3500
3450
3400
ORDINARY MOTOR
NEW TRI/CLAD '55'

HIGHER FULL LOAD SPEEDS is typical of many performance improvements in the new Tri/Clad '55' motor.





Better because **... They have no bonnet flanges, bonnet bolts, or bonnet welds. Ideal for high-pressure, high-temperature steam service and corresponding boiler feed service, Walworth Pressure-Seal Cast Steel Valves weigh less, and take up less space than the flanged bonnet type of valves used for similar services.**

These are a few of the important advantages made possible by the design of Walworth *Pressure-Seal* Cast Steel Valves. Internal line pressure is utilized within the bonnet to maintain a tight, leakproof, body-to-bonnet connection under all normal operating conditions. The higher the pressure, the tighter the seal.

Ask for your copy of Walworth Circular 143. It gives detailed information, including sizes, dimensions, and specifications for all Walworth Pressure-Seal Cast Steel Valves.

Cross section of 8-inch Series 900 Walworth Pressure-Seal Cast Steel Gate Valve. Pressure-Seal Globe, Check, Angle, and Non-Return Valves are also available in Series 600, 900, 1500 and 2500 in a wide range of sizes.

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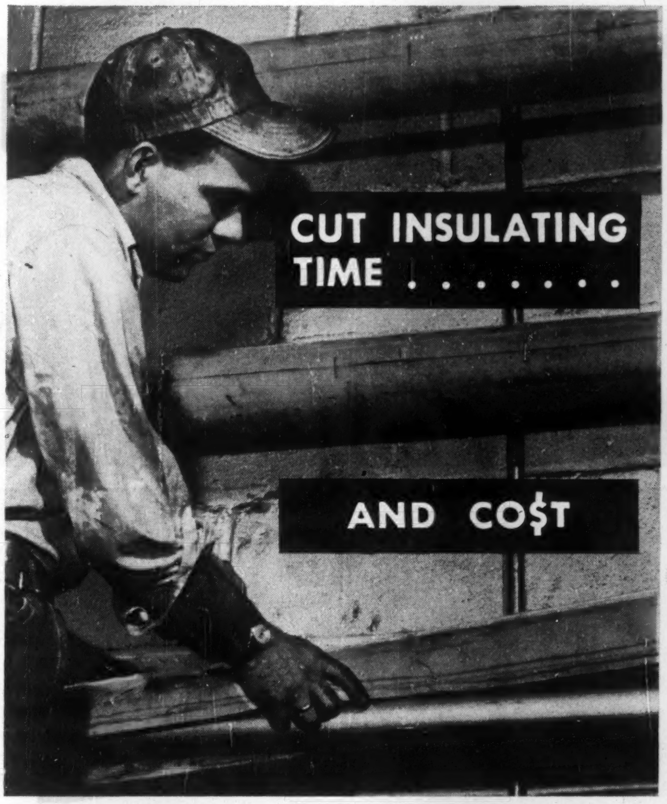

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MONO-KOVER

ONE PIECE PIPE INSULATION

Just spread each six-foot section over the pipe and it snaps into place. It doesn't splinter or crumble when cut — makes no mess to clean up. Such ease of handling saves up to 50% in time and cost. Take the B-H MONO-KOVER short-cut to fast completion of jobs and you'll find many more profitable installations coming your way.

B-H MONO-KOVER AVAILABLE WITH VAPOR-BARRIER JACKET

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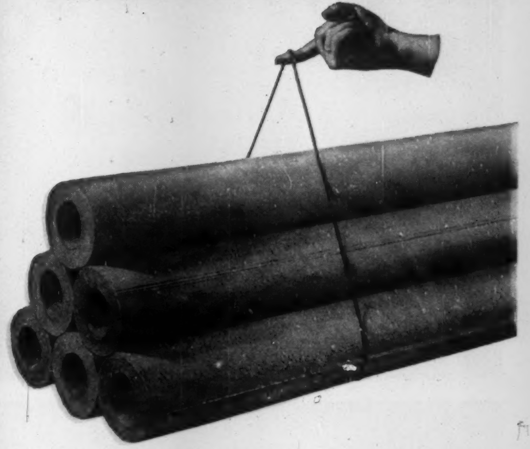
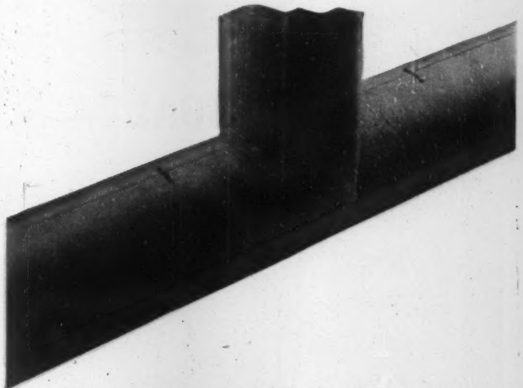
Kalamazoo, Mich. . . . Huntington, Ind. . . . Temple, Tex.

It's a SNAP to Apply



B-H MONO-KOVER is 4 to 10 times lighter than other types of pipe insulation. For example: a 6-foot section 1″ thick for 2″ pipe weighs approximately 1½ lbs. 96 lineal feet packaged for shipment, weigh only 29 lbs.

Firm, tough and resilient — but not rigid or hard — B-H MONO-KOVER is cut easily with a knife. No hack-sawing or hole-sawing is necessary. And there's less handling because of its one-piece construction.



The insulation of fittings and pipe joints is simplified by the use of B-H MONO-KOVER because it is so easy to cut and fit.

Want to remove dust-laden air...

or exhaust harmful fumes quickly?
BC46 UNIVERSAL BLOWER
ILG ELECTRIC VENTILATING CO.
CHICAGO, ILL.

Clear the air faster

at lower cost with

ILG®

CENTRIFUGAL FANS

Dust removal, waste conveyance, gas exhaust, supply blast, or rapid cooling . . . all of these air-borne problems vanish into thin air when there's a famous, dependable ILG Centrifugal Fan on the job in your plant! Motor and wheel are direct connected, avoiding money-wasting friction from belts, gears or sheaves . . . permitting important savings in space, weight, installation time, and maintenance costs. Easily installed on floor, wall or ceiling. ILG's famous "one-name-plate" guarantee covers the fan and ILG-built motor as one unit. Specify ILG . . . better by design since 1906.

Propeller Fans

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Power Roof Ventilators

ILG ELECTRIC VENTILATING CO.
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Write for FREE booklet!

ILG's Industrial Ventilation Guide gives you the important information you should have before you make plans for ventilating . . . write for your copy of Bulletin 1520A now!

ILG
INDUSTRIAL VENTILATION

Get
this report...
on the

BIG TRUTH

about boilers

Out of 86 years of experience in designing and building quality steam generating equipment comes one of the most revealing reports ever written on boilers. We at Kewanee make that statement because these findings are based on fact and truth . . . on careful search and engineering exploration. In it we present:

KEWANEE

RESERVE PLUS RATING

Here you will discover a way to judge boilers so you can be sure of the lowest operating cost—highest efficiency—greatest dependability—maximum flexibility—longer boiler life. You will learn how to eliminate confusion in considering boilers . . . know how to compare like examples and not be misled by vague technical claims. You can be SURE you have made the best buy when you know the BIG TRUTH about boilers . . . and you will choose Kewanee boilers because you know you will save on fuel—get greater efficiency—cut repair bills.

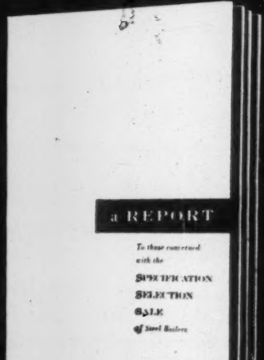
YOU can depend on KEWANEE engineering

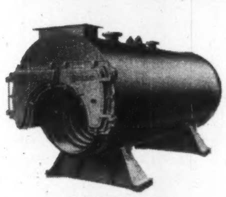
KEWANEE-ROSS CORPORATION—Kewanee, Illinois
Division of American Radiator & Standard Sanitary Corp.

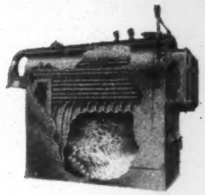
Serving home and industry • **American-Standard** • **American Blower**
Church Seats & Wall Tile • **Detroit Controls** • **Kewanee Boilers**
Ross Exchangers • **Sunbeam Air Conditioners**

THE KEWANEE REPORT **TELLS ALL . . .**

- *How to cut fuel costs.*
- *Data on "cruising speed" savings.*
- *Facts on "nominal capacity" operation.*
- *Why Kewanee Reserve Plus is the safe way to rate steel boilers.*
- *Facts on fallacy of buying on "maximum capacity."*


a REPORT
To those concerned with the
SPECIFICATION
SELECTION
SALE
of Steel Boilers


KEWANEE M-800 SERIES


KEWANEE TYPE "C" SERIES

DISCOVER THE BIG TRUTH ABOUT BOILERS

Send for this free booklet. You will be glad for 20 years if you act today. Use handy coupon.

KEWANEE-ROSS CORPORATION—Kewanee, Ill.
Please send me free book titled, "A REPORT to Those Concerned with the SPECIFICATION, SELECTION, SALE, of Steel Boilers"

Name____________________

Title____________________

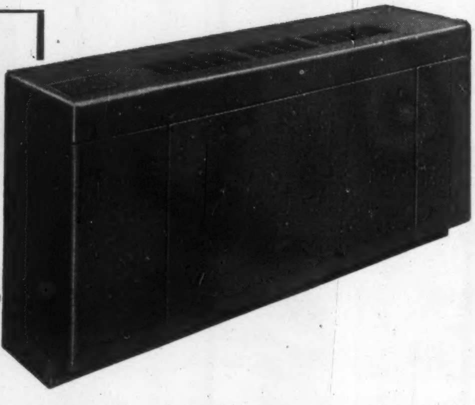
Company____________________

Address________ **City**________ **State**________

HPAC

Simple, efficient, easy to install...

The REMOTAIRE
by
AMERICAN-Standard



- **Year 'round heating and cooling**
- **Central plant, multi-room installation**
- **Individual room temperature control**
- **Filters and circulates the air**
- **Single piping circuit**

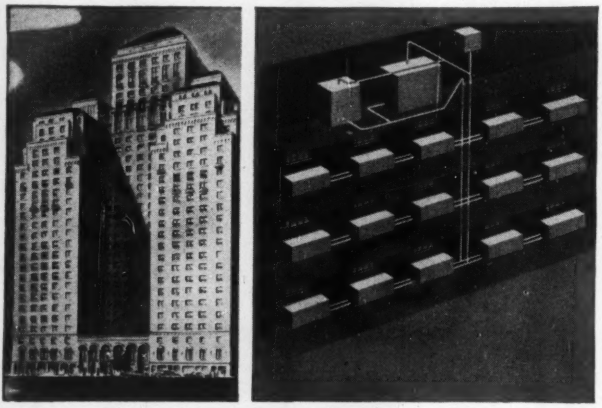
■ Remotaire installations are simple and direct. The same piping circuit carries chilled water for summer cooling, hot water for winter heating. There is no bulky ductwork. Water is conditioned in a central plant, yet temperatures can be controlled individually in each room where a unit has been installed.

Remotaire units have reversible coils for right or left hand connections. And each part of the unit is easy to get at.

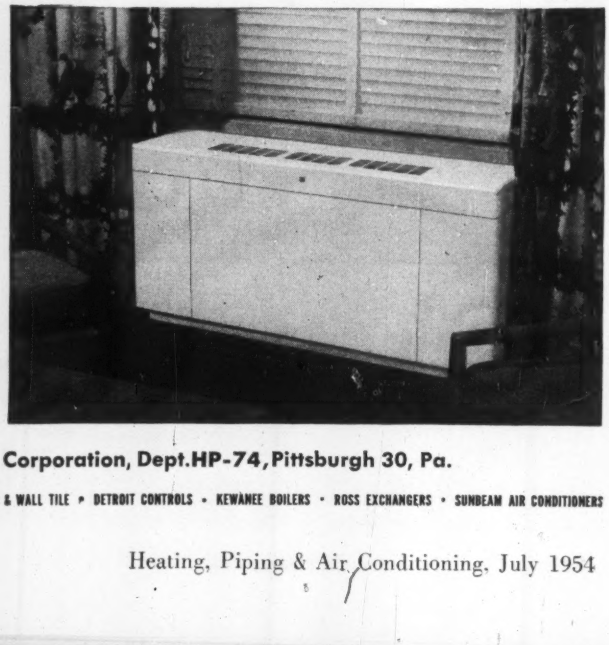
To meet all types of installation requirements Remotaire units are available in 200, 400, and 600 cfm capacities.

Your customers will like the Remotaire. Heating and cooling performance is outstanding. The installation looks good, too. Units come in handsome semi-gloss Cooltan jackets but can be painted to match the room interior if desired. Remotaire units can be installed free standing, partially recessed, or totally recessed.

Contact your local American-Standard sales office or your wholesale distributor for more information about Remotaire performance and installation, or write for literature—Form 417.



THE REMOTAIRE IS VERSATILE. An example of a Modernization System is the Park Sheraton Hotel of New York. The above rendering shows how simple the Remotaire piping is. Picture below illustrates our attractive Remotaire unit in a Park Sheraton Hotel room.



AMERICAN-Standard
WATER HEATING-COOLING SYSTEMS

American Radiator & Standard Sanitary Corporation, Dept.HP-74, Pittsburgh 30, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

HOFFMAN "WATCHMAN" CONDENSATION PUMP

TYPE "WC-8-20" Specifications

RATING: Up to 8000 Sq. ft. E.D.R.

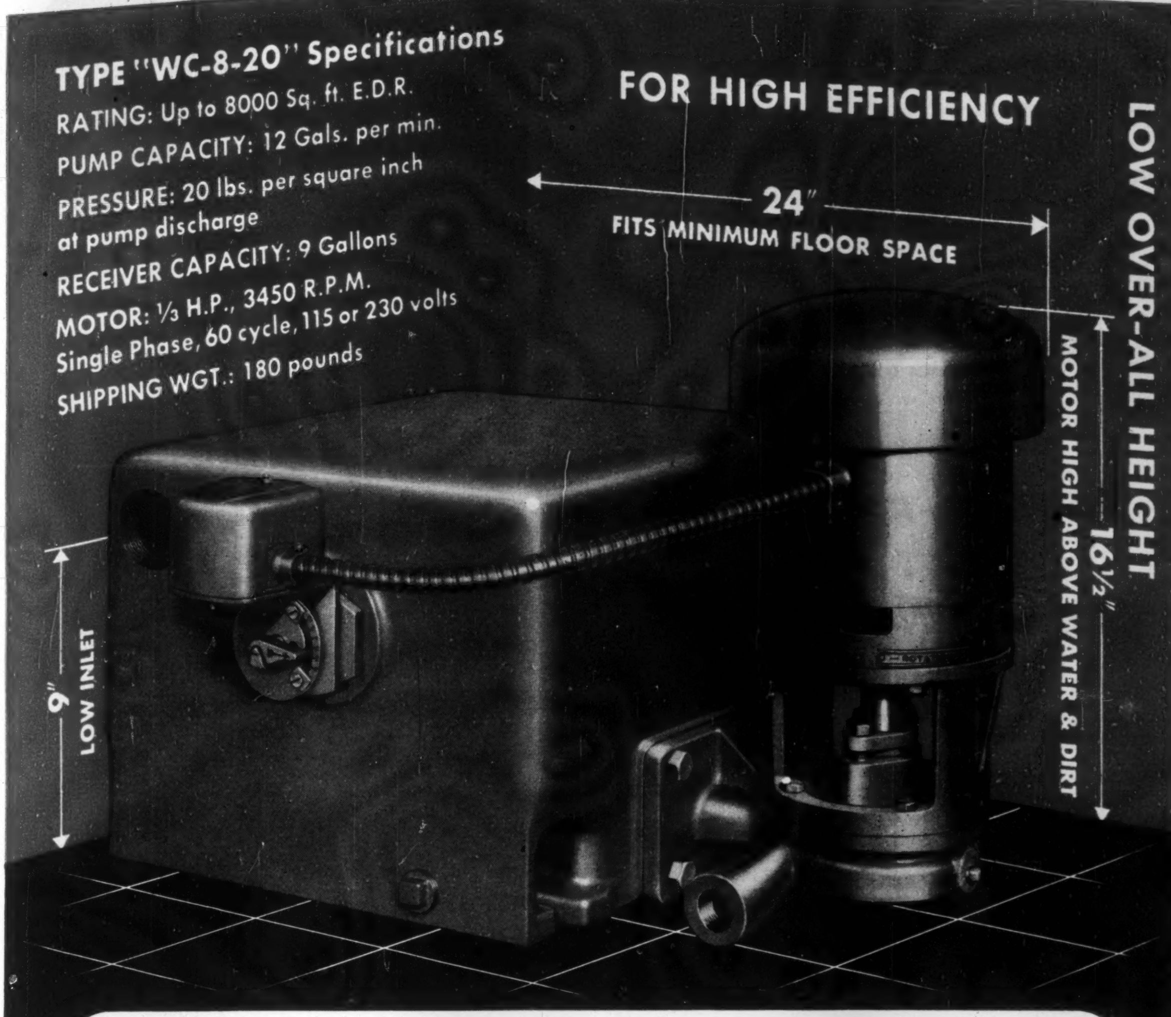
PUMP CAPACITY: 12 Gals. per min.

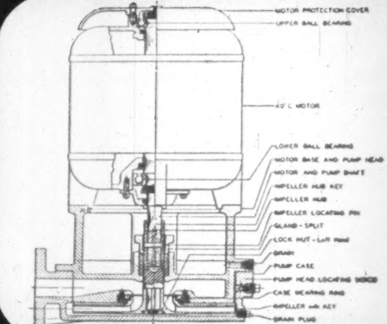
PRESSURE: 20 lbs. per square inch at pump discharge

RECEIVER CAPACITY: 9 Gallons

MOTOR: 1/3 H.P., 3450 R.P.M. Single Phase, 60 cycle, 115 or 230 volts

SHIPPING WGT.: 180 pounds


FOR HIGH EFFICIENCY
24"
FITS MINIMUM FLOOR SPACE
LOW OVER-ALL HEIGHT
16½"
MOTOR HIGH ABOVE WATER & DIRT
9"
LOW INLET


MOTOR PROTECTION COVER
UPPER BALL BEARING
40° C MOTOR
LOWER BALL BEARING
MOTOR BASE AND PUMP HEAD
MOTOR AND PUMP SHAFT
IMPELLER HUB KEY
IMPELLER HUB
IMPELLER LOCATING PIN
GLAND - SPLIT
LOCK NUT - Left Hand
DRAIN
PUMP CASE
PUMP HEAD LOCATING SCREW
CASE WEARING RING
IMPELLER and KEY
DRAIN PLUG

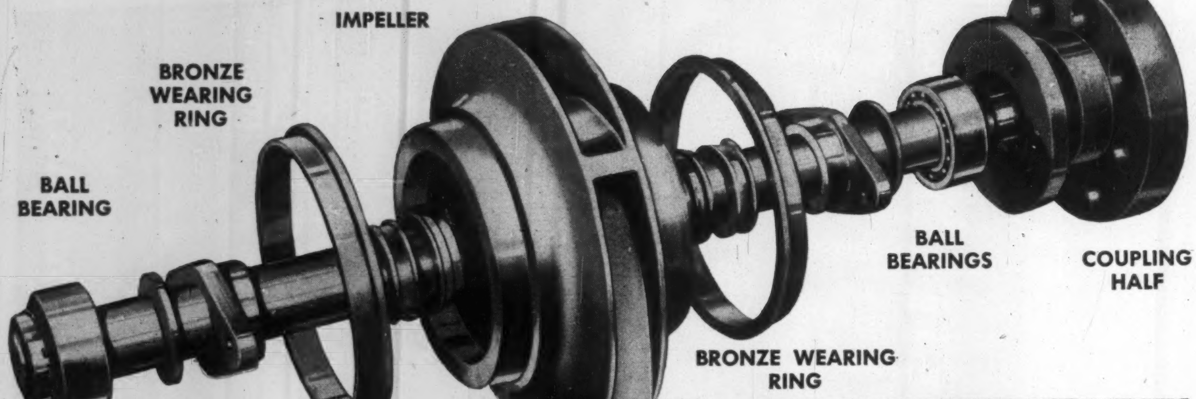
Here is a vertical, close coupled pump for low pressure heating systems, featuring: 1. One piece cast bronze centrifugal impeller dynamically balanced for smooth running and long life. 2. Receiver of heavy rust resistant cast iron. 3. All operating parts including motor and impeller assembly can be inspected or replaced without disturbing inlet or discharge piping. 4. Two pole heavy duty float switch easily adjusted.

This compact, highly efficient pump is ideal as a replacement for old Boiler Return Trap installations. Immediate delivery can be made from stock. Ask your jobber for full particulars with prices or write for new Hoffman Condensation Pump Catalog, no obligation.

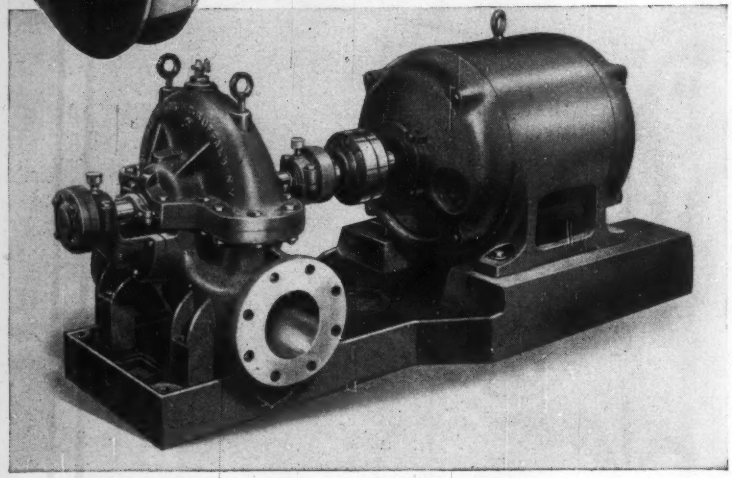
HOFFMAN SPECIALTY MFG. CORP. • 1001 York Street, Indianapolis 7, Indiana

Makers of Valves, Traps, Hot Water Heating Systems, Vacuum and Condensation Pumps... Sold by Leading Wholesalers of Heating and Plumbing Equipment

INSIDE STORY OF A BETTER PUMPING VALUE



IMPELLER-AND-SHAFT ASSEMBLY OF A "BUFFALO" DOUBLE SUCTION PUMP



"Buffalo" Double Suction Pump

Take a look at the "heart" of a clear water pump that is built for performance and endurance! Note the oversize shaft and ample ball bearings to stand the severest continuous-service strains. The double suction enclosed impeller is hydraulically balanced and has vanes and shrouds shaped for maximum efficiency. The two large bronze wearing rings on either side of the impeller prevent leakage, thus keeping efficiency high.

And in the pump casing, water passages are simply formed with ample area to avoid friction losses and sudden changes of velocity. (Top half of casing is easily removable without disturbing piping, for quick servicing of impeller and stuffing boxes).

Here is a pump that cuts your costs where economy really counts — in continued high efficiency, in freedom from breakdowns, in easy maintenance and the kind of lifetime performance you need on your pumping job. Write for Bulletin 955-P and check construction data on these pumps in sizes from 10 to 14,000 gpm.

"Buffalo" PUMPS

BUFFALO PUMPS, INC.

171 MORTIMER ST. BUFFALO, N.Y.

Subsidiary of Buffalo Forge Company

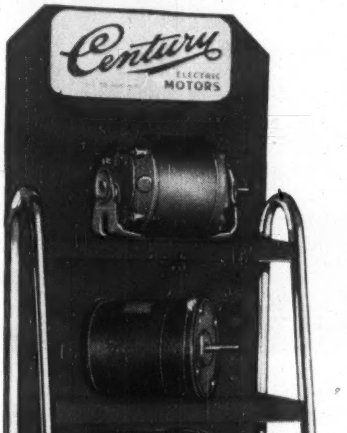
Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

Now from Century

TWO EASY WAYS TO GET YOUR SHARE OF PROFITABLE MOTOR REPLACEMENT BUSINESS

SELL MOTORS ON SIGHT WITH THIS
Century Silent Salesman



Take advantage of the BIG, constantly growing demand for replacement motors with these and other motors from the Century Line.

① MAINTAIN YOUR OWN MODEST STOCK OF *Century* MOTORS FOR RESALE

- Most often, when folks need a replacement motor, they need it QUICK. You can fill that need—and gain their loyalty—by selling them top quality motors from *Century's Complete Line.*
- A stock of Century Motors prepares you for profitable replacement business with most makes of compressors, oil burners, blowers, unit heaters, pumps, fans, appliances, and scores of other motor-driven products.
- Free, with your order for only ten Century Motors, you get the attractive red and chrome metal display stand shown here. It identifies you as the man to see for replacement motors. You'll show more motors, sell more motors with this display, in just a few square feet of space. Limit of one display stand per customer.

② WORK CLOSELY WITH YOUR COOPERATIVE *Century* SERVICE STATION

- Century's network of service stations is nation-wide. There's one in your vicinity—ready to give you delivery on practically any Century Motor your customers might need.
- Every Century Service Station is staffed by men whose skill you can use to solve your motor service problems . . . men who can help you get more profitable motor replacement business.

CENTURY ELECTRIC COMPANY St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

GET ALL THE DETAILS of the CENTURY Motor Selling Plan
...MAIL THIS COUPON TODAY!

Century C MOTORS

837

CENTURY ELECTRIC COMPANY
1806 Pine Street, St. Louis 3, Missouri

I want all the facts about Century's motor replacement selling plan.

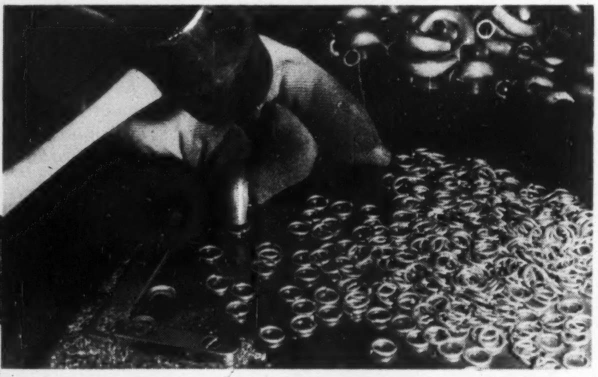
Name..
Company..
Address..
City.................................... Zone........ State..............

68 leak-proof joints in 2⅔ minutes

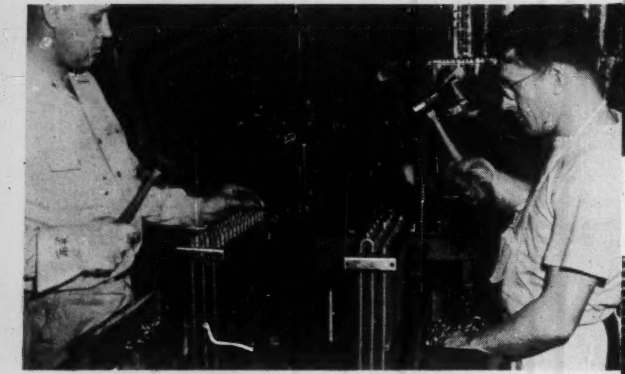
SIL-FOS brazing does it!

This job goes to prove once more that you can't beat the brazing of non-ferrous metals with the low-temperature silver alloy SIL-FOS. And it also shows what a simple matter it is to get fast, economical production with SIL-FOS. Brazing return bends on the condenser and the evaporator of the FEDDERS room airconditioner is the job — and here's how it's done.

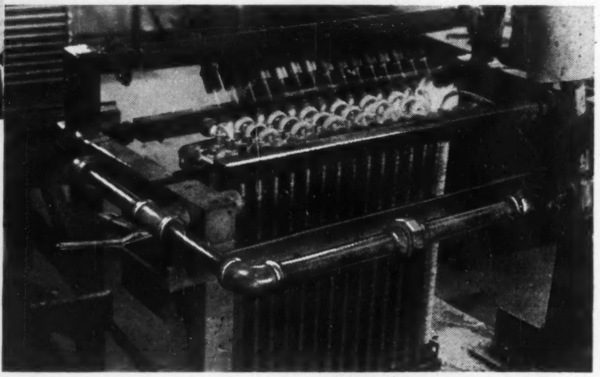
Photos and data courtesy of Fedders-Quigan Corp., Buffalo, N. Y.



SIL-FOS wire rings are placed on ends of return bends and positioned in the simple jig in lower left. ▶



◀ Return bends with SIL-FOS rings in place are assembled on the tubes of the condenser.



The 3 rows of return bends are brazed at one time in this simple gas-air burner set-up — 40 joints in less than 1 minute. ▶

Return bends on the evaporator are done the same way — 28 joints in 1⅔ minutes.

BULLETIN 20 tells how to get fast brazing production

It gives complete facts about low-temperature SIL-FOS brazing and goes into detail about good joint design and fast production brazing methods. Write for a copy today.

EASY-FLO
SIL-FOS

HANDY & HARMAN
FOUNDED 1867
QUALITY · SERVICE
ORIGINATORS OF EASY-FLO & SIL-FOS

HANDY & HARMAN

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MONTREAL, CANADA

HOTEL DESOTO

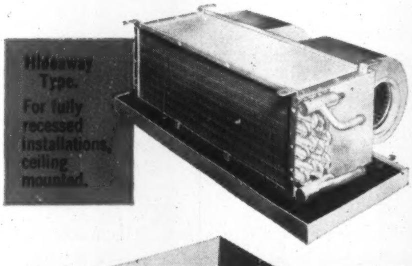
SAVANNAH, GEORGIA

Floor Type, installed in the hotel lobby. For free standing mounting along walls or beneath windows.

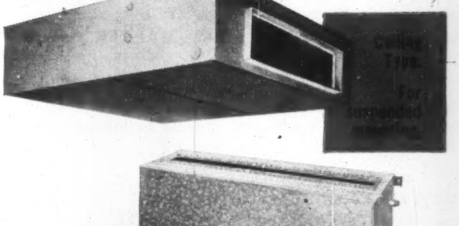
When the management decided to modernize Hotel DeSoto, Savannah, Ga., air conditioning, naturally, was one of the first considerations. J. Garnett Andrews, chairman of the board, and Charles G. Day, president, selected Mingledorff's Inc. as their air conditioning contractor. Through Savannah Refrigeration Supply, Inc., the local McQuay wholesaler, Mingledorff's purchased 183 McQuay Seasonmakers. Their installation assures Hotel DeSoto's guests of individual room air conditioning at its best.

Modernized with McQuay Seasonmakers

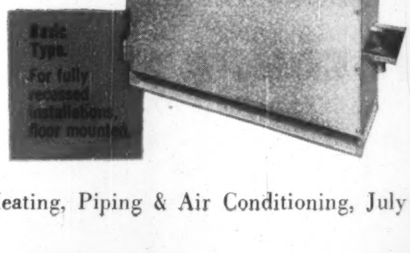
INDIVIDUAL ROOM AIR CONDITIONERS



Hideaway Type. For fully recessed installations, ceiling mounted.



Ceiling Type. For suspended mounting.



Basic Type. For fully recessed installations, floor mounted.

● Famous McQuay Seasonmakers have made the luxury of individual room air conditioning practical for any multi-room building . . . for new or old construction . . . for hotels, tourist courts, apartment houses, office buildings, institutions and residences—wherever the best in air conditioning comfort is demanded.

Four types in three different sizes, 200, 400 and 600 CFM, simplifies your job of selecting a unit that will meet set requirements such as Floor type for free standing, Ceiling type for suspended mounting, Basic type for fully recessed wall installations as well as Hideaway type for concealed mountings in furred ceilings, closets, or vestibules. Quiet operation and flexible design allows you to select the correct unit for any job.

Exclusive Ripple-Fin coil construction assures long life and dependable service. Designed for easy installation and maintenance. Get complete details on features and specifications in Bulletin 703. Representatives in principal cities or write McQuay Inc., 1601 Broadway N.E., Minneapolis 13, Minnesota.

McQuay INC.

★ AIR CONDITIONING ★ REFRIGERATION ★ HEATING

for PEAK PERFORMANCE on All Air Conditioning Systems

Catch-All
TYPE C-8424
DIRECTION OF FLOW

buy Sporlan right down the line!

and by Right Down the Line Peak Performance we refer to **4 VITAL ITEMS** *that can* ***Make or Break*** *any Air Conditioning System!*

Let's look at item No. 1... The Filter-Drier! Clean, dry, acid-free, sludge-free refrigerants are yours when you use a Sporlan Catch-All!

Only Sporlan can offer you the Catch-All, the perfect filter-drier with the molded porous core. It offers the greatest filtering area, and the highest degree of activation for the removal of acid, water, sludge and foreign particles. It cannot powder. It cannot pack, and it dries the refrigerant to an end point so low that any remaining moisture is absolutely harmless!

Sporlan also offers you the perfect answer in item No. 2... Solenoid Valves! Nothing can touch the Peak Performance of Sporlan Solenoid Valves. They're tight closing, their coils are layer wound (not random wound), they're so well insulated, so moisture proof, that they defy electrical failure!

Item No. 3... The Thermostatic Expansion Valve is important, too! For maximum evaporator capacity at all times, it is essential to eliminate hunting in air conditioning valves. Fortunately, thanks to Sporlan's FLOW MASTER element, you will never have to worry over alternately flooded and starved evaporators again... just order a Sporlan valve with FLOW MASTER element and Peak Performance is yours!

But, how about item No. 4... The Refrigerant Distributor? To get Peak Performance in all evaporators, Sporlan distributors have a perfectly designed nozzle and conical button to assure uniform distribution to all circuits.

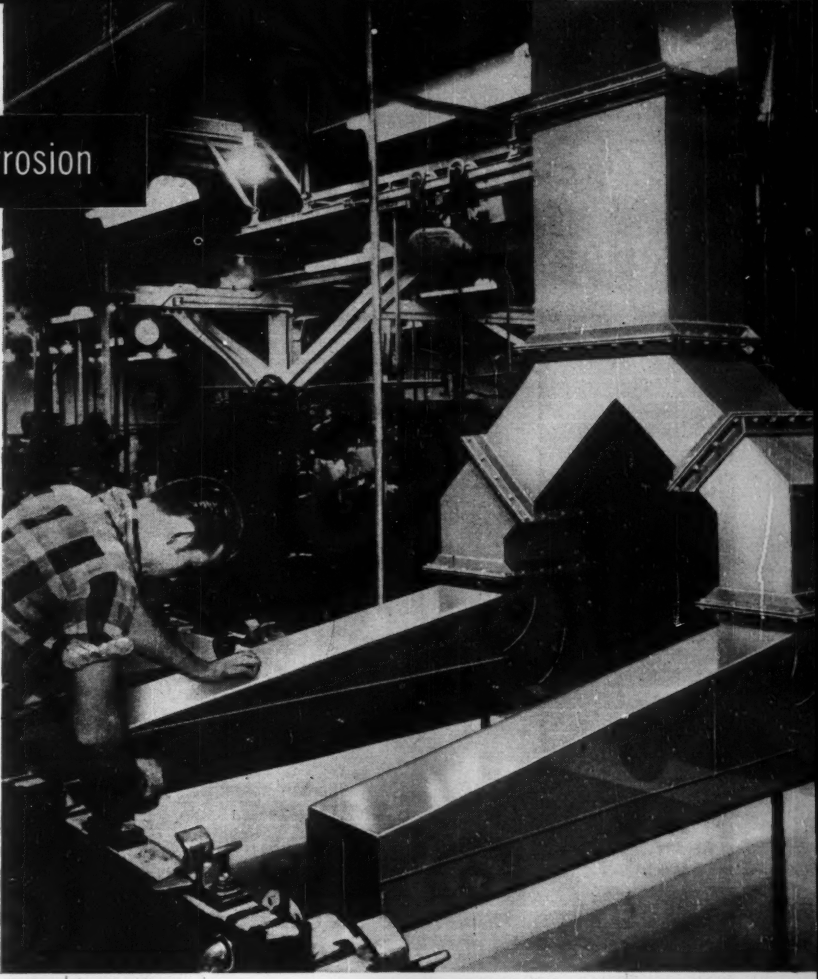
THERE'S A SPORLAN WHOLESALER NEAR YOU... BE SURE TO CALL HIM TODAY!

So Remember... item for item, every Sporlan product will give you Peak Performance... so why not get Peak Performance Right down the Line on ALL air conditioning applications... specify Sporlan throughout!

SPORLAN

SPORLAN VALVE COMPANY
7525 SUSSEX AVENUE ST. LOUIS 17, MO.
EXPORT DEPARTMENT 89 BROAD STREET NEW YORK 4, N. Y.

How Exon 402-A wipes out corrosion



Installation by Horace Blackman Co.

Photographs courtesy H. N. Hartwell & Son, Inc., Boston 16, Mass.

ACIDS ate through every metal tried

...but could not affect

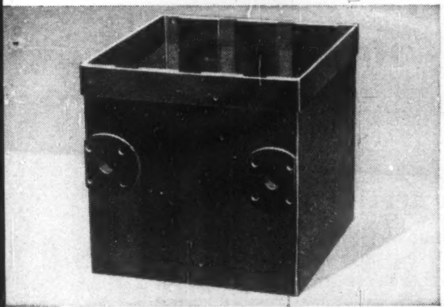
Boltaron 6200

The toughest, most corrosion-resistant metals used failed to hold electro-plating acid fumes at Cannon Electric Company, Los Angeles.

In 2 months, the solution of 33% nitric, 33% sulfuric acid, and 33% fluoride salts destroyed ducts and tanks.

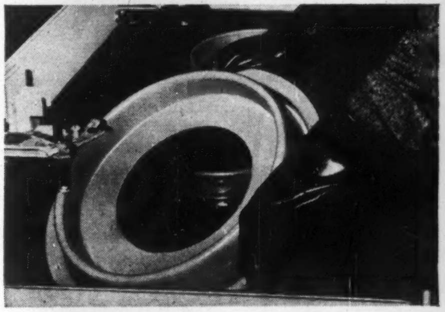
In June, 1953, Plant Engineer Byron Hill installed a completely new ducting system of Boltaron 6200.

It has been in continuous operation ever since. Its present condition is utterly unmarked. Maintenance costs have been wiped out.



★ Eastman Kodak Co., Rochester, reports that Boltaron 6200 remained completely uncorroded by ferricyanide after 3 years, when no other material lasted 3 months.

Installation by Industrial Plastic Fabricators, Inc.



★ A switch to Boltaron 6200 copper-plating rings wiped out corrosion in this equipment at Norris-Thermador Co., Los Angeles. Extremely close tolerances were maintained.

Installation by Horace Blackman Co.

★ For 18 months, sulfuric acid fumes have failed to corrode a Boltaron fume removal system at Electric Storage Battery Company, Fairfield, Conn.

New rigid, extremely versatile, light weight materials are making corrosion a memory in industry all over America. These unplasticized polyvinyl chlorides are typified by Boltaron 6200.

Firestone's Exon 402-A resin meets Boltaron's exacting specifications—best assurance of uniform results under the most corrosive conditions.

These materials can be welded, sawed, sheared, stamped, milled, molded, planed, drilled, embossed, rolled and cemented—on conventional woodworking or metalworking equipment.

For details that will interest you in particular, call or write:

Firestone EXON

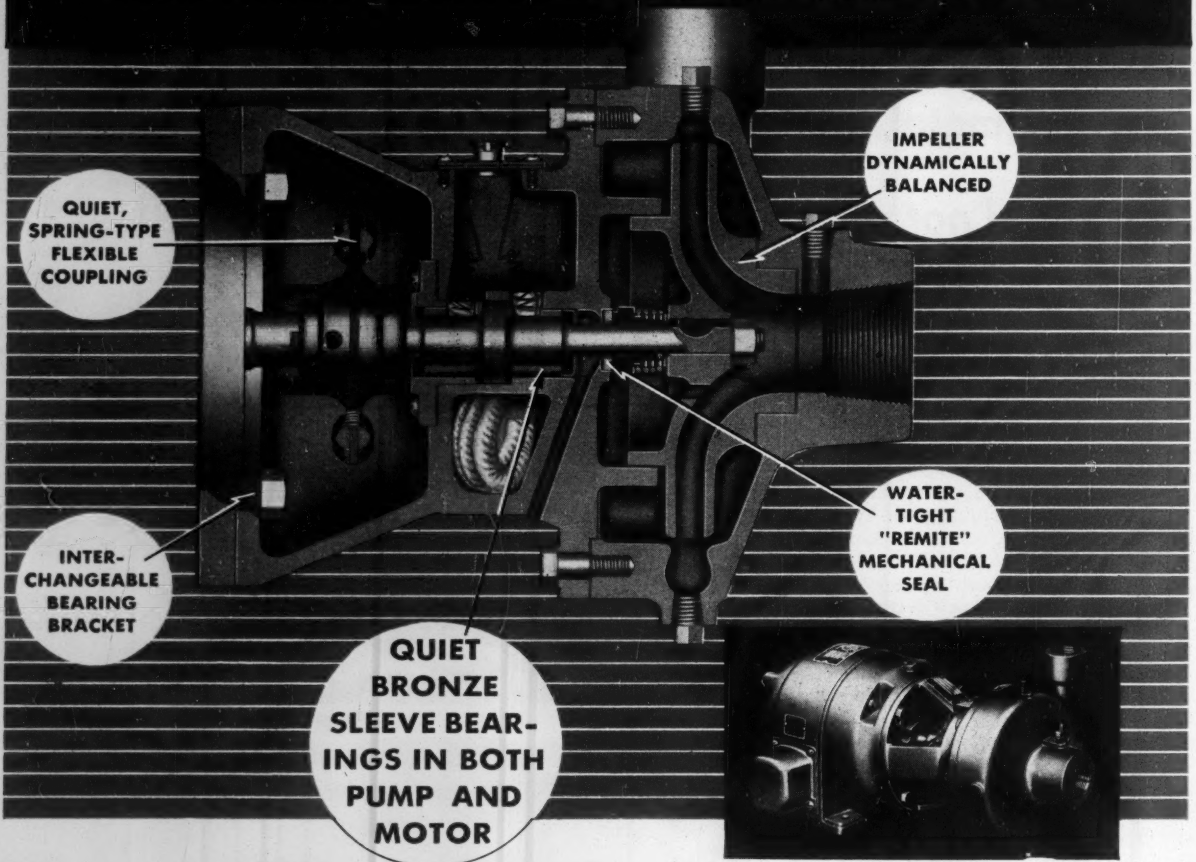
Chemical Sales Division

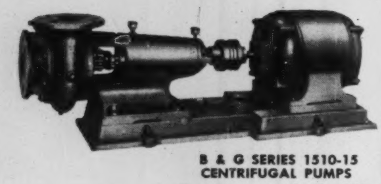
FIRESTONE PLASTICS COMPANY, DEPT. 23-A, POTTSTOWN, PENNSYLVANIA
A DIVISION OF THE FIRESTONE TIRE & RUBBER CO.

NOTE: Firestone supplies the resin only, does not manufacture the end product.

B&G 1522 PUMPS ARE *QUIETER*

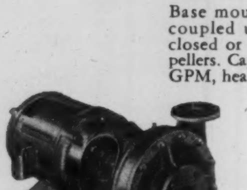
THAN OTHER PUMPS USED FOR THE SAME PURPOSE


QUIET, SPRING-TYPE FLEXIBLE COUPLING
IMPELLER DYNAMICALLY BALANCED
INTER-CHANGEABLE BEARING BRACKET
WATER-TIGHT "REMITE" MECHANICAL SEAL
QUIET BRONZE SLEEVE BEARINGS IN BOTH PUMP AND MOTOR



B & G SERIES 1510-15 CENTRIFUGAL PUMPS

Base mounted, flexible coupled units with enclosed or semi-open impellers. Capacities to 1200 GPM, heads to 320 ft.



B & G SERIES 1531 UNI-BUILT CENTRIFUGAL PUMPS

Integral motor, enclosed impeller, "Remite" leak-proof seal. Capacities to 1200 GPM, heads to 400 ft.

THE TROUBLE-FREE PUMP FOR COOLING TOWER AND OTHER REFRIGERATION APPLICATIONS

Why be pestered with complaints about noisy pumps when it's so easy to avoid this common cause for dissatisfaction?

The B & G Series 1522 Pump is amazingly *quiet*, because both pump and motor are equipped with *long bronze sleeve bearings*...and because the flexible spring coupler successfully dampens noise!

In the 1522 you'll find a combination of features which assure dependable performance. The "Remite" Mechanical Seal, for example, ends leakage troubles. It's self-lubricating—*harder than glass*—wear-proof! The impeller is dynamically balanced for vibrationless operation—the bearing bracket assembly, including shaft and sleeve bearing, is interchangeable. Servicing is a simple matter—the 1522 separates into three parts.

With all these *plus* values, the B & G 1522 Pump is *competitively priced!* You can have it as an all-iron, bronze-fitted, all-bronze or stainless steel unit, with capacities to 150 GPM—heads to 115 feet.

Send for size and capacity data on B & G Series 1522, 1531, 1510-15 Centrifugal Pumps

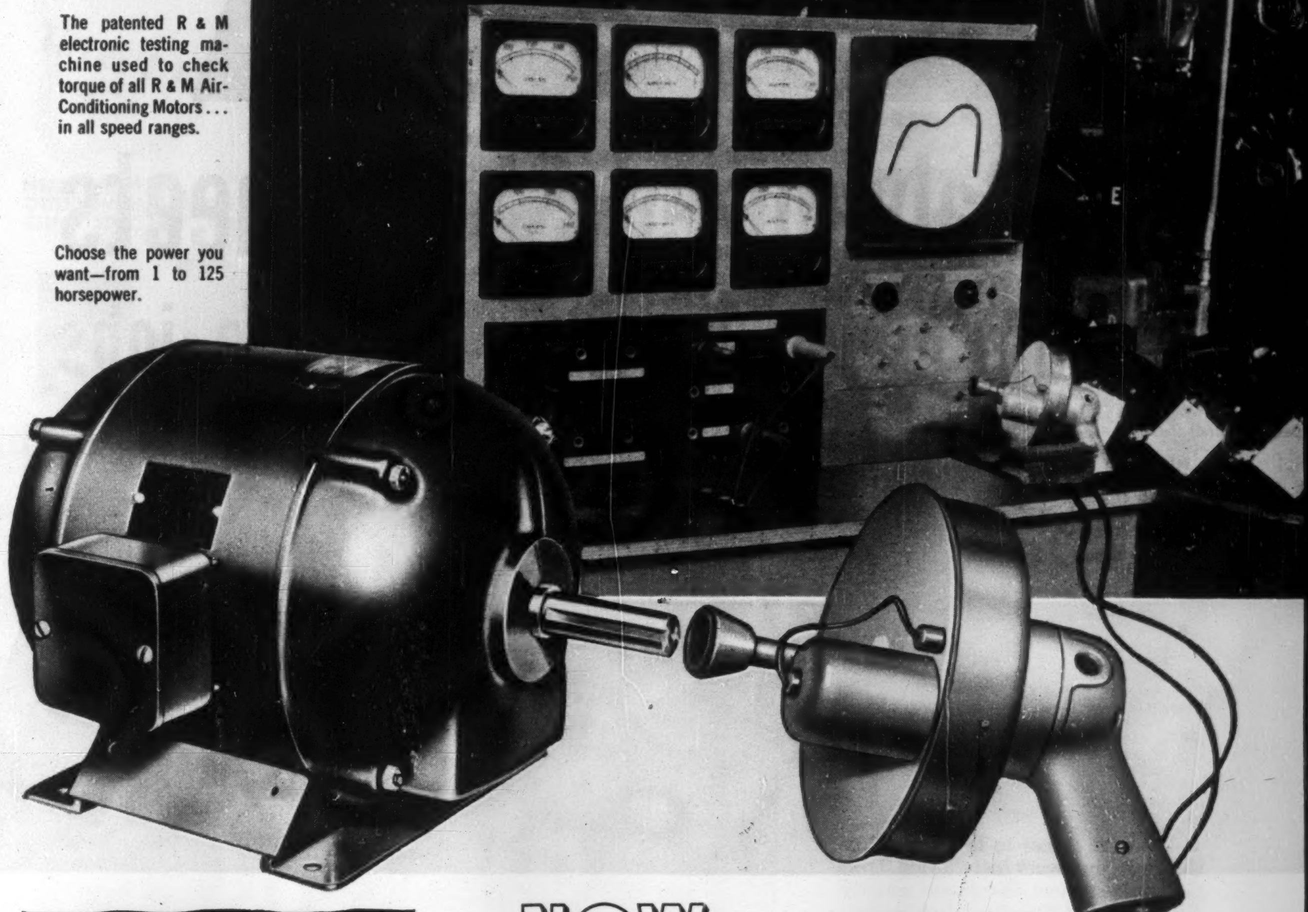
BELL & GOSSETT COMPANY

Dept. RDM-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

The patented R & M electronic testing machine used to check torque of all R & M Air-Conditioning Motors . . . in all speed ranges.

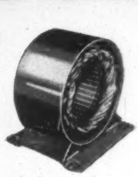
Choose the power you want—from 1 to 125 horsepower.



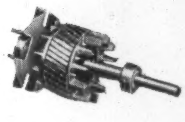
"Weatherized" inside and out—

AT NO EXTRA COST!

NOW . . . get the torque YOU want . . . by specifying ROBBINS & MYERS!

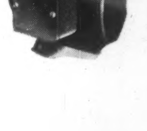


Steel parts undercoated with baked-on "Robbinite."



Rotor and shaft assembly sprayed with special rust inhibitor.

Cast-iron parts get special anti-corrosion treatment.



Terminal box—cast-iron—gasketed; leads sealed. Repellent grease keeps moisture out of bearings.

R & M motors have not only the right construction features for air-conditioning service, but the right *torque characteristics* as well.

That's because we have completely eliminated guesswork in determining the starting and acceleration performance of our induction motors. Tested by a unique electronic machine over the entire speed range, each motor *shows* its own *complete* accelerating curve, including that part which is almost impossible to obtain by other methods.

For you, this means your R & M motor will not "hang up" at some low speed—the "dips" have been designed out. And this patented speed-torque tester proves it!

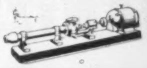
And, here's something you'll want to know about *installation*. You can reconnect—*on the job*—all R & M standard 220/440 volt motors for 220 volt part-winding increment starting. Thus, only half normal starting current is drawn—without need for autotransformers or resistors.

Want more details? Write for Bulletin 400HP, showing all the advanced construction features of R & M motors. It costs you nothing, of course, to find out about the finest air-conditioning motor your money can buy!

ROBBINS & MYERS, INC.

MOTOR DIVISION · SPRINGFIELD, OHIO · BRANTFORD, ONTARIO

Fractional & Integral H.P. Motors & Generators

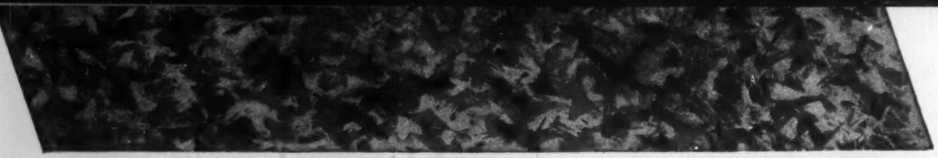


Moyno Pumps

Propellair Industrial Ventilating Equipment

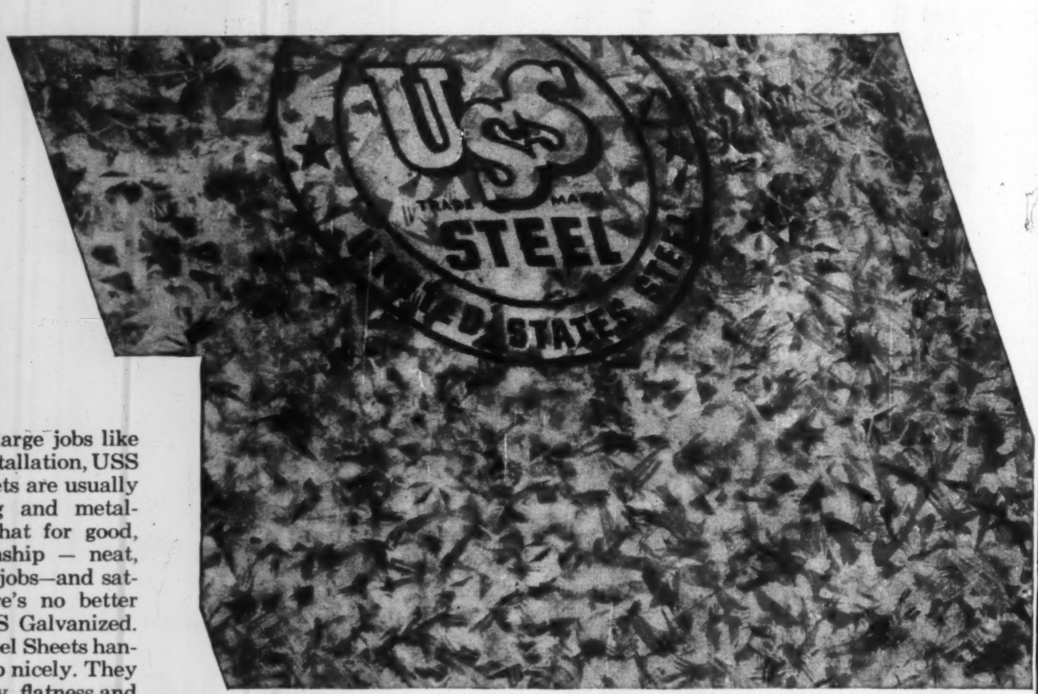
Electric Fans

Electric & Hand Hoists & Cranes



USS Galvanized Steel Sheets

... uniform workmanship on large jobs



● When it comes to large jobs like this huge ductwork installation, USS Galvanized Steel Sheets are usually first choice. Heating and metal-working men know that for good, time-saving workmanship — neat, long-wearing finished jobs—and satisfied customers, there's no better sheet to use than USS Galvanized.

USS Galvanized Steel Sheets handle easily, and work up nicely. They are uniform in ductility, flatness and surface finish; and can be bent, rolled, stamped or cut in minimum time with completely satisfactory results. And their tightly-adhering coating of zinc is highly resistant to cracking and flaking, assuring a long-lasting finish that contributes to the pleasing appearance and durability of every job you turn out.

Your customers know the USS name—they recognize that it stands for dependable quality in steel sheets. So take advantage of the benefits of USS Galvanized Steel Sheets for all your jobs. For more information, ask your sheet distributor or our nearest district office. United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
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UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS GALVANIZED STEEL SHEETS

4-1229

UNITED STATES STEEL

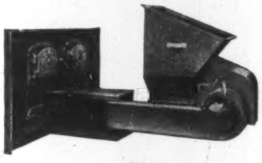
THERE'S A CANTON STOKER TO MEET EVERY MODERN NEED—ECONOMICALLY

CANTON STOKER CORPORATION

Specialists in Automatic Coal FIRING, HANDLING and CONTROL Equipment

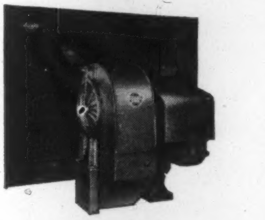
CALL THE REPRESENTATIVE NEAREST YOU

HERE ARE THE OUTSTANDING TYPES, SIZES, STYLES BEING SPECIFIED TODAY . . .



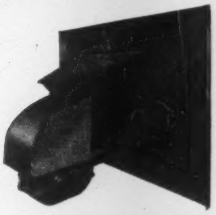
THE DURAFLEX DELUXE WORMFEED

Includes ash dump grates, unit or divided drive. For loads up to 275 H. P.



THE VULCAN RAMFEED

For use where steam demands vary rapidly and service conditions are severe. For loads up to 800 H. P.



THE LO-SET RAMFEED

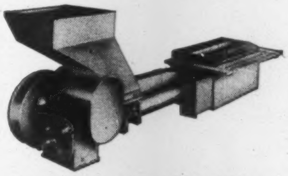
Requires less headroom, saves space and often costly pitting. For loads up to 350 H. P.

THE DURAFLEX STANDARD WORMFEED

Includes solid ash plates, heavy duty tuyeres and sectional feedworm. For loads up to 275 H. P.

LO-SET RAMFEED SINGLE ASH DUMP

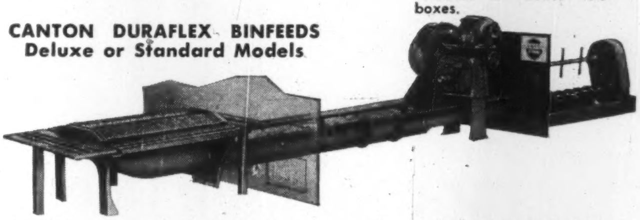
For special or very narrow furnaces or boiler fireboxes.



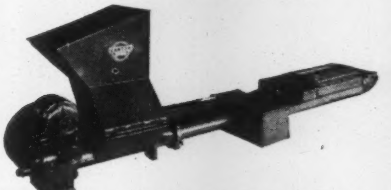
CANTON KILN STOKER

For ceramic kiln firing.

CANTON DURAFLEX BINFEEDS
Deluxe or Standard Models



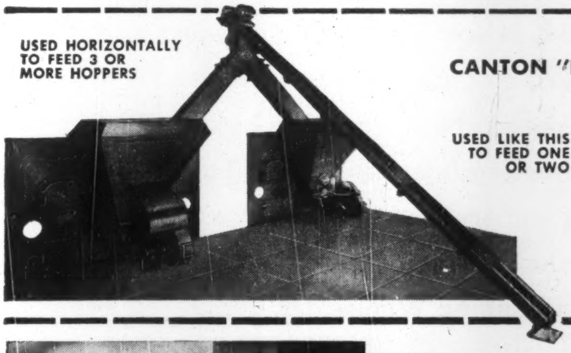
Available with or without ash dumping grates; unit or divided drives; front, rear or side boiler entry; ash sprays and furnace fronts. For loads up to 275 H. P.



CANTON ROYAL SCOT

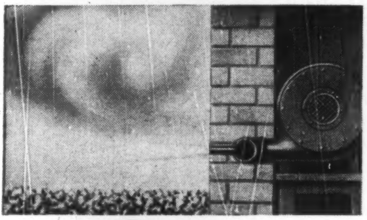
A unit type wormfeed stoker for automatically, efficiently firing Scotch Marine boilers.

CANTON "FLO-TUBE" HEAVY DUTY CONVEYORS



USED HORIZONTALLY TO FEED 3 OR MORE HOPPERS
USED LIKE THIS TO FEED ONE OR TWO
COAL ENTERS EXPOSED END

Screw type conveyors deliver coal from bin or pile automatically . . . free men for more exacting duties. "Off-on" switches will maintain desired levels in hoppers. Capacities to 10,000 lbs. per hour. Also widely used for conveying other materials such as steel chips, grain, pellets, wood waste, sand, etc.



CANTON "TURBO-AIRE" SYSTEMS FOR SMOKE CONTROL

Effects complete combustion. Simply "burns the smoke where the smoke begins." For boilers to 1000 H. P.

CANTON "SYNCHRO" COMBUSTION CONTROLS

Automatically adjusts fuel feed, air supply, boiler draft and combustion rates in proportion to steam demand or water and weather temperatures. Applicable to other forms of proportioning control.

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ATLANTA
Cypress 7331
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CHICAGO
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INDIANA
FT. WAYNE
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Market 3326
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Linden 10626
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CANTON STOKERS

CANTON STOKER CORPORATION

2400 ANDREW PLACE S. W. • CANTON, OHIO • PHONE 3-9133

*When you count **all** the costs...*

You can't beat COPPER for drainage lines

CHASE COPPER WATER TUBE is *economical* for soil, waste and vent lines when you count the *installed cost* and add the customer satisfaction it brings. With Chase Copper Tube you can do a better job *in only a fraction of the time that other materials require.* Chase Tube comes in long 20 foot lengths... pre-cutting and pre-assembling is practical. Next time you figure a job, count *all* the costs of installing Chase Copper Water Tube... then call your Chase Plumbing Wholesaler.

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

Write for full information on new Chase movie "Down the Drain." It is loaned free to trade groups and associations.

The Nation's Headquarters for Brass & Copper

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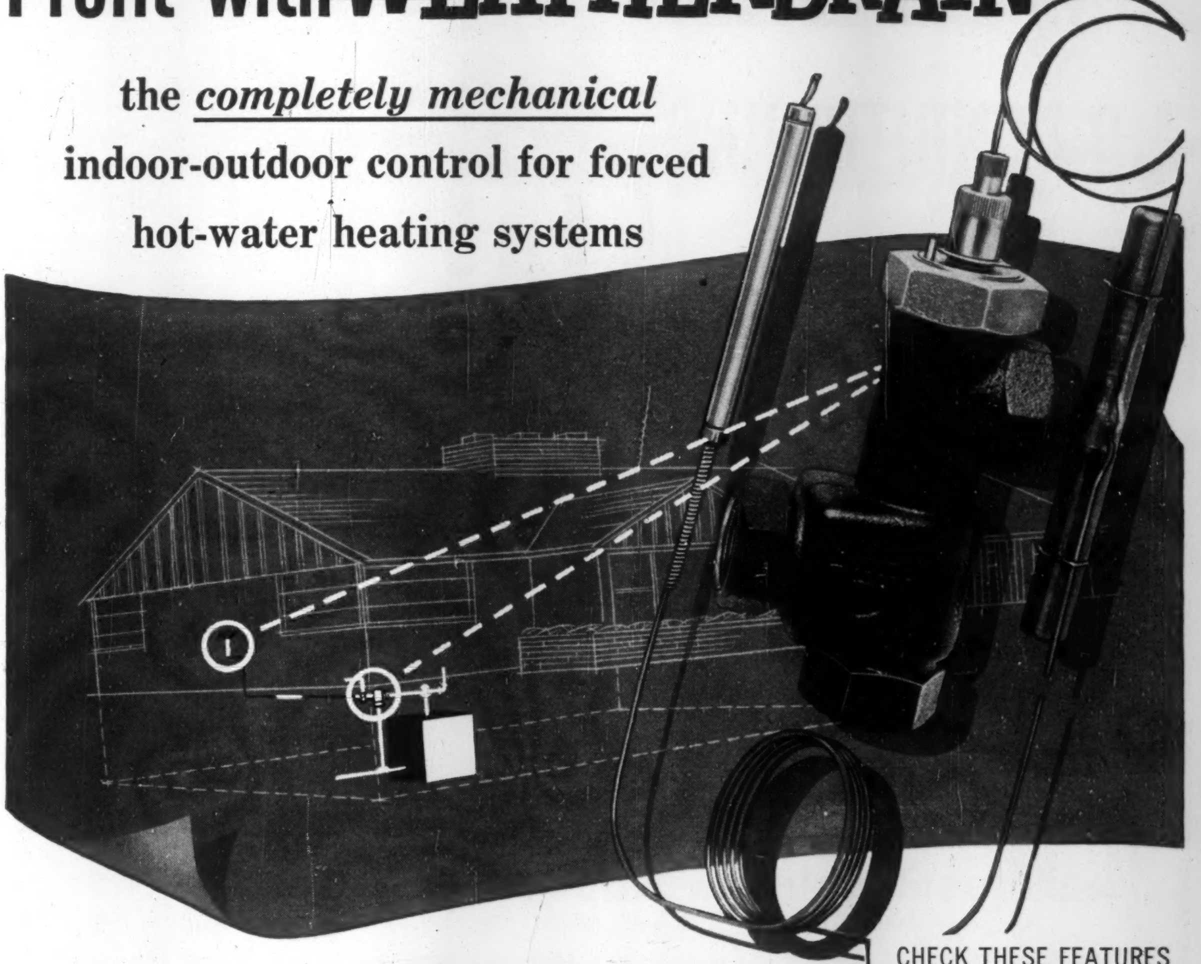
Profit with WEATHERBRAIN

the *completely mechanical* indoor-outdoor control for forced hot-water heating systems



Completely automatic • Inexpensive

No electronic tubes, relays or delicate mechanisms

Easily installed • Assures constant comfort

Now you can cash in on big, new profits in the hot water heating field with Detroit's amazing new Weatherbrain Control. That's because Weatherbrain indoor-outdoor control offers heating comfort never before possible in forced hot-water heating systems—constantly uniform and completely automatic with no manual adjustment required. The Weatherbrain Control's outdoor bulb senses changes in outside temperature and responds instantly by supplying the exact amount of heat to keep room temperature right where it should be! And because it is entirely mechanical in operation with no expensive, complicated electronic circuits, Weatherbrain Control costs less and is easily installed. See your Detroit Controls wholesaler today or write us direct at the factory for bulletin No. 254.

CHECK THESE FEATURES

- Varies the water temperature delivered to panels or radiation in exact accordance with the demands of the weather.
- Good for zone systems due to simplicity and reasonable cost.
- Gradual changes in water temperature in the system minimize the undesirable effects of thermal expansion and contraction.
- Very valuable where more than one type of radiation is used or domestic hot water is heated by the boiler, in which cases the electrical boiler resetting type control can not be used.

DETROIT CONTROLS *Corporation*

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Division of AMERICAN RADIATOR & STANDARD SANITARY Corporation
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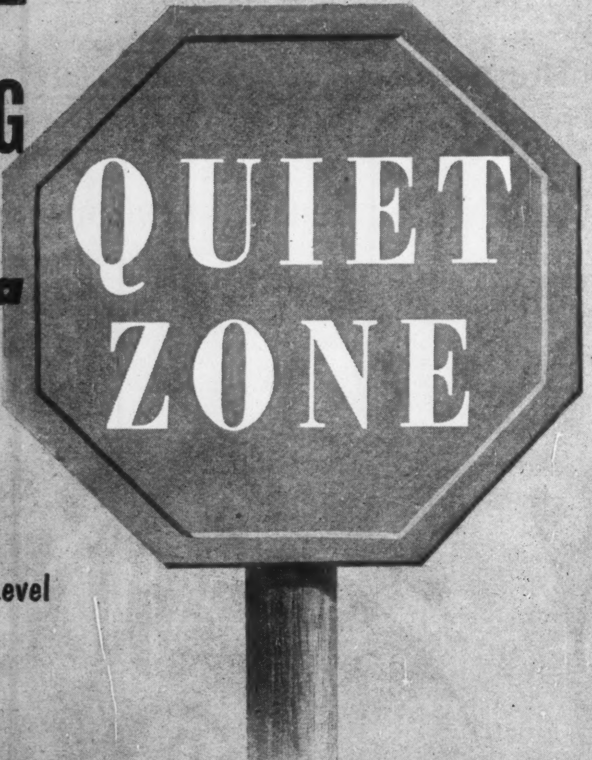
AUTOMATIC CONTROLS *for* REFRIGERATION
AIR CONDITIONING • DOMESTIC HEATING • AVIATION • TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES
Serving home and industry
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

with *Marlo*

AIR CONDITIONING

every room is a



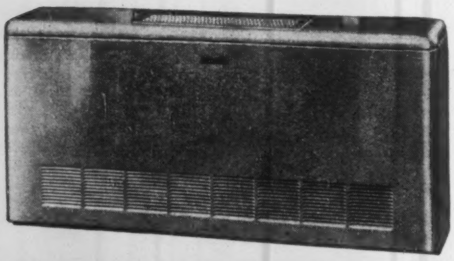
Marlo SEAZONAIRE Units

Operate at Absolute Minimum Noise Level

for Peaceful, Undisturbed Comfort

Designed and built *with silence in mind,* Marlo Remote Room Units are the most practical answer to the problem of air conditioning hotels, motels, offices and other areas in which quiet operation is essential. This important feature is achieved through careful attention to the smallest detail of engineering and construction, with special emphasis on

- **low operating speeds**
- **low fan tip speed and low fan outlet velocities**
- **interior coating of sound-absorbent mastic**
- **heavy-gauge, vibration-resistant steel cabinets**
- **extra large motor bearings and shaft diameters to reduce vibration**



Marlo units are easy to install, easy to maintain, provide individual selection of desired temperature in summer and winter.

Write today for details on the complete line of Marlo-quality air conditioning equipment.

Marlo
COIL COMPANY

Manufacturers of COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS • AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS

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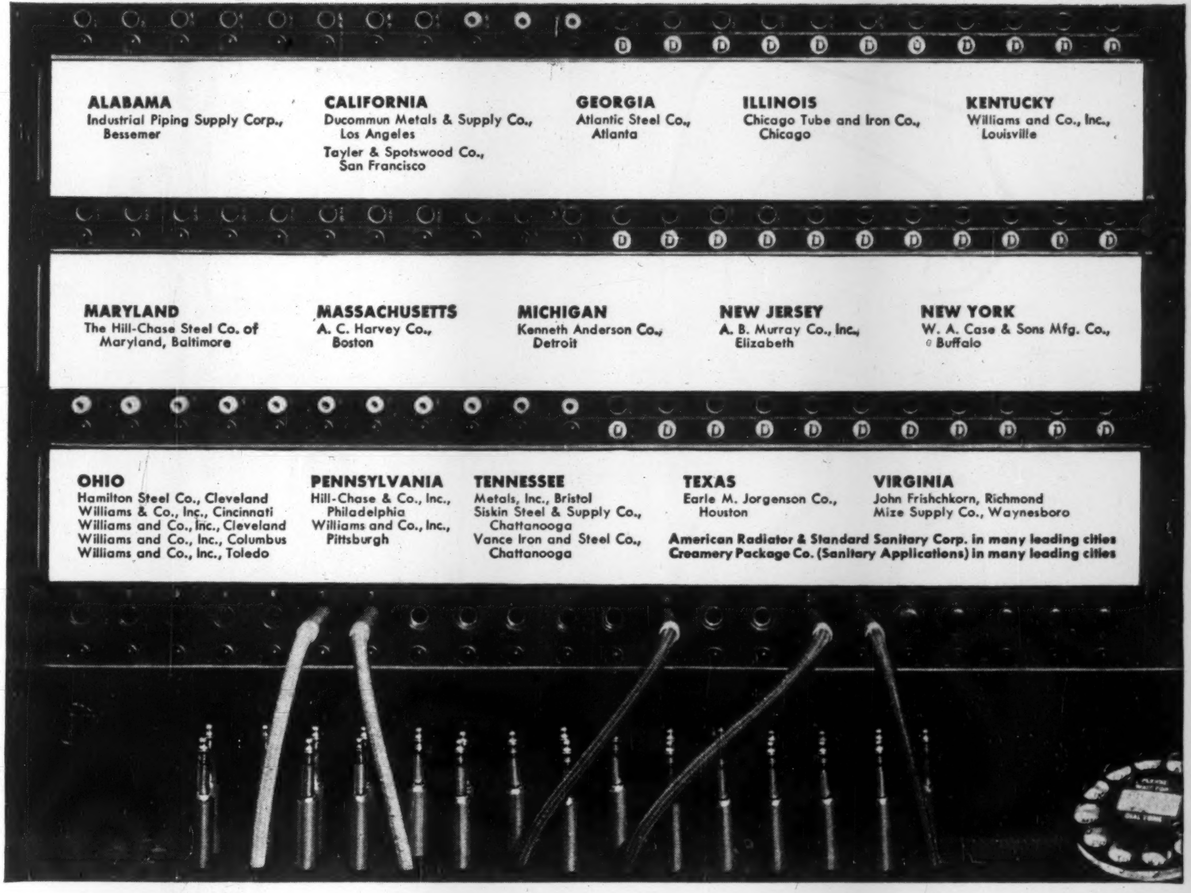

ALABAMA
Industrial Piping Supply Corp., Bessemer

CALIFORNIA
Ducommun Metals & Supply Co., Los Angeles
Tayler & Spotswood Co., San Francisco

GEORGIA
Atlantic Steel Co., Atlanta

ILLINOIS
Chicago Tube and Iron Co., Chicago

KENTUCKY
Williams and Co., Inc., Louisville

MARYLAND
The Hill-Chase Steel Co. of Maryland, Baltimore

MASSACHUSETTS
A. C. Harvey Co., Boston

MICHIGAN
Kenneth Anderson Co., Detroit

NEW JERSEY
A. B. Murray Co., Inc., Elizabeth

NEW YORK
W. A. Case & Sons Mfg. Co., Buffalo

OHIO
Hamilton Steel Co., Cleveland
Williams & Co., Inc., Cincinnati
Williams and Co., Inc., Cleveland
Williams and Co., Inc., Columbus
Williams and Co., Inc., Toledo

PENNSYLVANIA
Hill-Chase & Co., Inc., Philadelphia
Williams and Co., Inc., Pittsburgh

TENNESSEE
Metals, Inc., Bristol
Siskin Steel & Supply Co., Chattanooga
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American Radiator & Standard Sanitary Corp. in many leading cities
Creamery Package Co. (Sanitary Applications) in many leading cities

All it takes to get Republic Stainless Steel Pipe

No need to spend time tracking down the stainless steel pipe you need for a job. Just a phone call to your nearest Republic distributor will start the ball rolling.

It doesn't matter how the pipe has to be joined, either. Republic ELECTRUNITE Stainless Steel Pipe can be welded, threaded, or used with compression fittings. And you can have it in types 304, 304-L, 316, 316-L, 321 and 347, along with other analyses. Sizes from ⅛″ I.P.S. through 2″ I.P.S. in A.S.A. schedule 40S; from ⅛″ I.P.S. through 4″ I.P.S. in schedule 10S; and from ½″ I.P.S. through 4″ I.P.S. in schedule 5S wall thicknesses. Larger sizes of pipe, or pipe in special analyses are available on request.

Get in touch with your Republic distributor today. You'll find he's a good man to do business with, because he knows ELECTRUNITE Stainless Steel Pipe. And he's always glad to help.

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231 East 131st Street, Cleveland 8, Ohio
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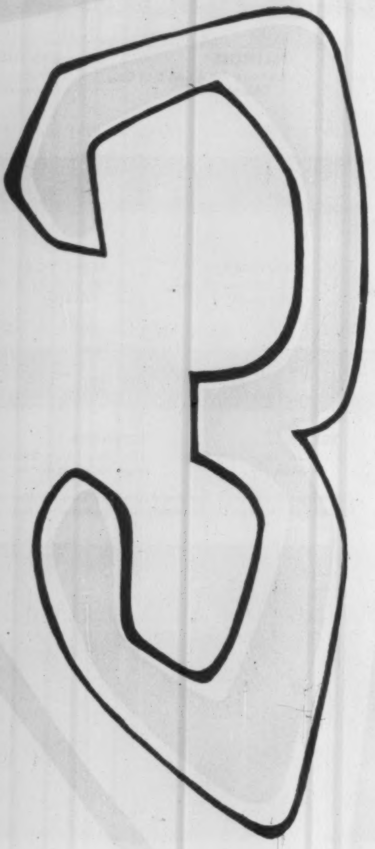
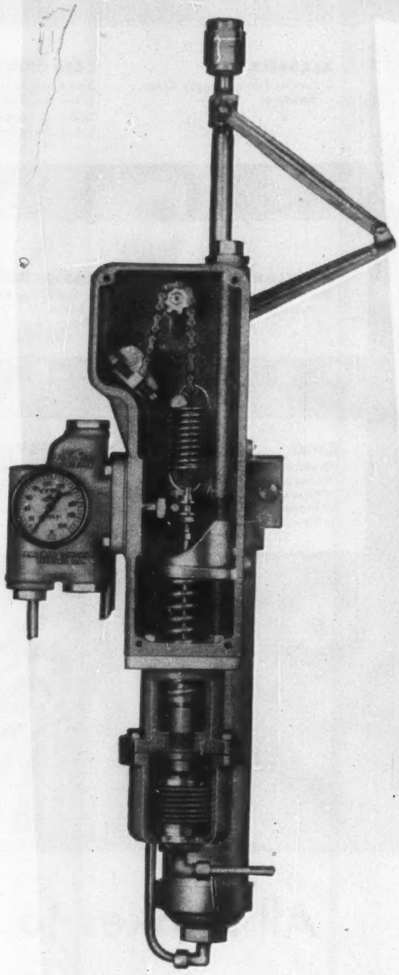
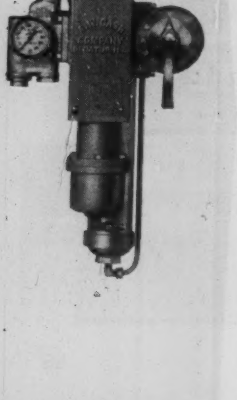
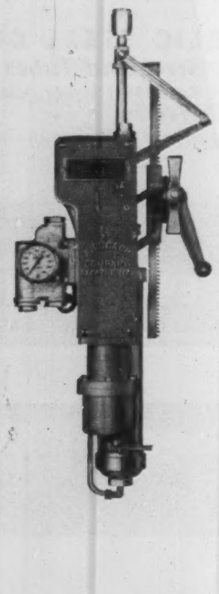
Republic
REPUBLIC STEEL
ELECTRUNITE
STAINLESS STEEL TUBING AND PIPE

REPUBLIC ELECTRUNITE ® STAINLESS TYPE









The CASH STANDARD 100 Series Automatic Controllers will position levers, electrical controls, valves and other processing equipment to the most exacting degree of accuracy.

CASH STANDARD

P. O. BOX 551, DECATUR, ILLINOIS

An engineer from Quinn & Feiner, Refrigeration and Air Conditioning contractors, shown checking the largest reciprocating compressor installation in the East.

McCrory's

IS A PLEASANT PLACE TO SHOP

p·k COOLERS ARE INSTALLED HERE

McCrory's spacious and sparkling new store at Livingston Street in Brooklyn is the world's largest variety store. Careful planning has made it an inviting place to shop.

p·k dry expansion freon coolers, an integral part of the air conditioning system, supply chilled water to eight remote conditioners. Four of these coolers – three in the subbasement and one on the second floor – provide a total capacity of 350 tons of refrigeration in which they cool 1000 GPM of water to 44 deg. F.

Economical and efficient, **p·k** coolers have earned a place for themselves in commercial and industrial building. A pioneer in the development of many types of heat exchange equipment, **p·k** has provided exchangers for virtually every type of application.

What are your heat exchange needs? Heating? Cooling? Custom built or standard units? **p·k** has a wealth of experience in helping people like yourself select the proper equipment for their particular applications. **p·k** catalog #101-A gives standard range of freon coolers.

PK the **Patterson-Kelley Co.,** inc.
770 Burson Street, East Stroudsburg, Penna.

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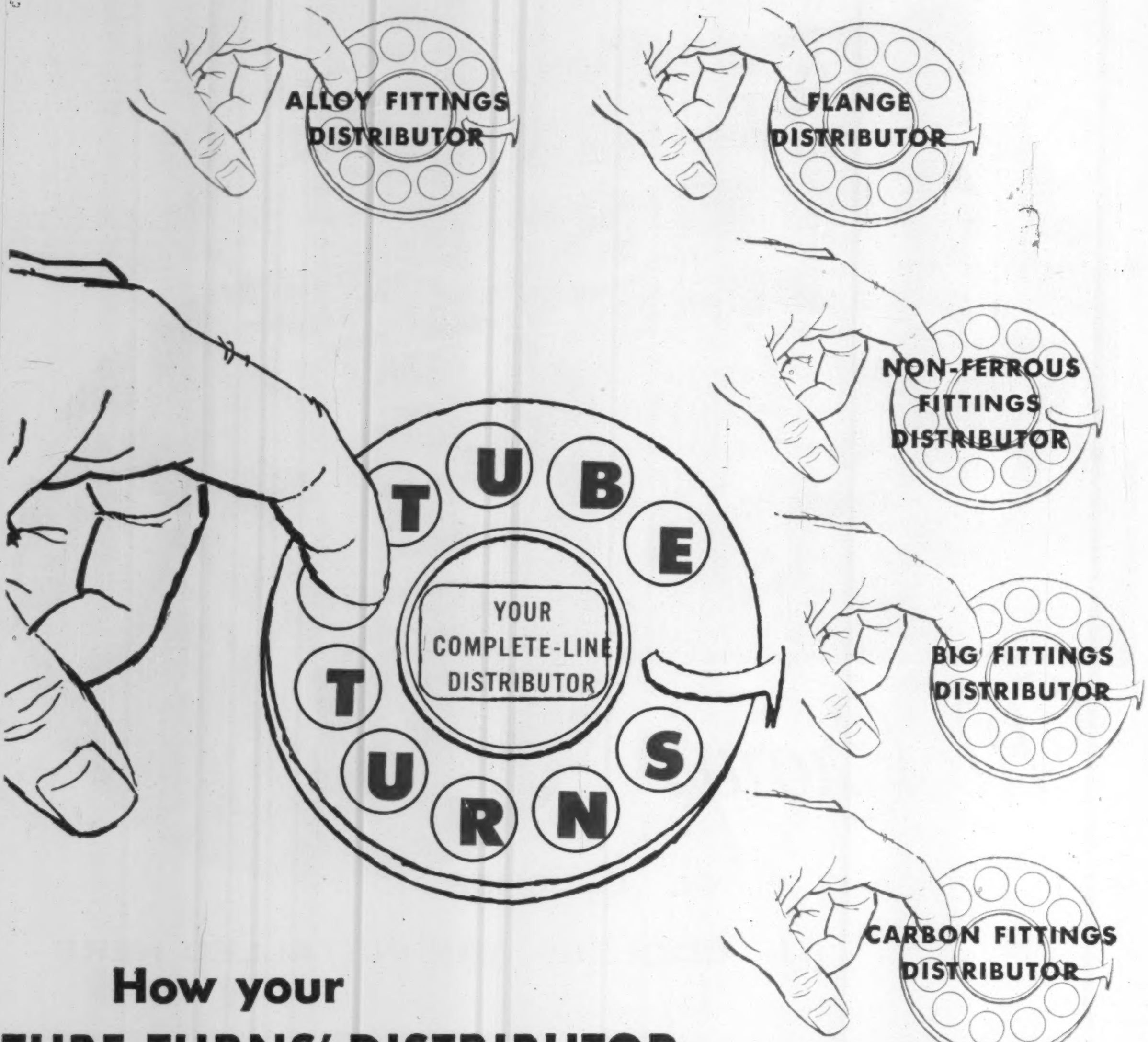
101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities.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YOUR COMPLETE-LINE DISTRIBUTOR
BIG FITTINGS DISTRIBUTOR
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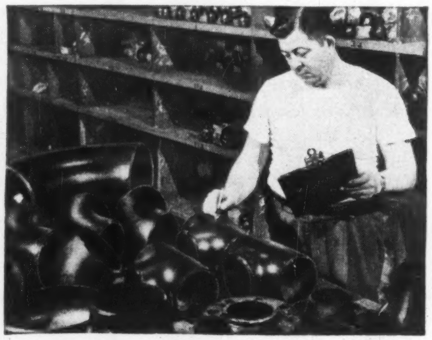
How your TUBE TURNS' DISTRIBUTOR saves you time and money



ONE CALL . . . ONE ORDER is all it takes to fill *all* your needs in welding fittings and flanges when you buy from your Tube Turns' Distributor. He provides industry's broadest line—over 4000 top quality items—different types, sizes, schedules and materials. He saves your purchasing time, cuts your red tape, acts as your warehouse and gives you prompt delivery and money-saving assistance on piping problems... backed by Tube Turns' world-famous engineers.

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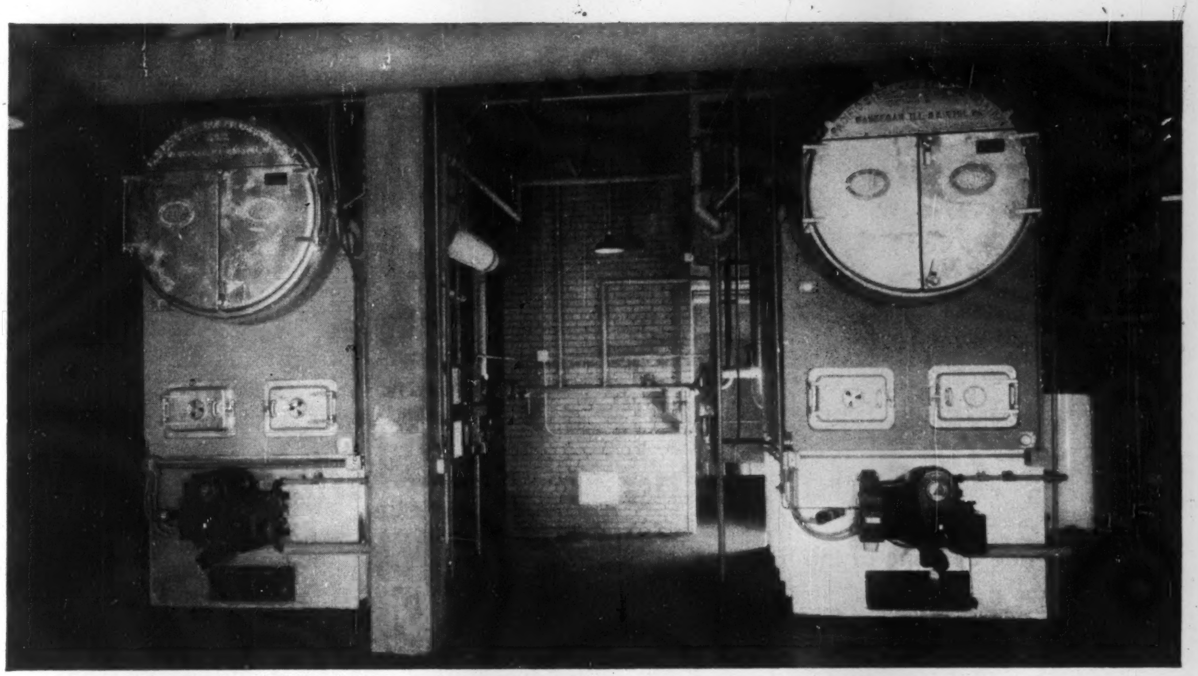


Two Pacific Boilers installed in Federal's new Grand River-Oakman store in Detroit.

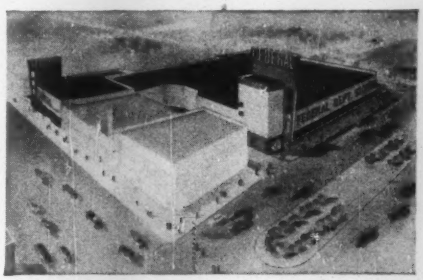
Two Pacific Boilers for newest link in Federal chain

The new Grand River-Oakman store in Detroit is the latest step taken by Federal Department Stores, Inc., in their tremendous growth to a position high among the leading retailers in the country. Contributing to this growth has been Federal's regard for customer comfort—that's why their new store has two big Pacific Boilers with Jet-action Circulation.

Pacific's exclusive Circulating Connections increase the speed at which steam and hot water leave the water leg. These jet-like streams scrub the insulating steam bubbles off the heating tubes and keep these bubbles in motion. This means greater efficiency, maximum heat transfer, and immediate response when temperature changes are required.

The efficiency of Jet-action Circulation also gives Pacific Boilers their unmatched fuel economy—particularly important to cost-conscious retailers.

Any building—commercial, industrial, institutional—whether old or new, is a better building with Pacific Boilers with Jet-action Circulation. Your local Pacific representative will gladly show you why. Call him for details today.



Federal Dept. Store, Grand River & Oakman, Detroit, Mich. Architect – Chas. N. Agree Inc.; General Contractor – O. W. Burke Co.; Heating Contractor – Ralph Peckham Co.

H

Designed
Constructed
and Stamped in
Accordance with
ASME Code

SBI

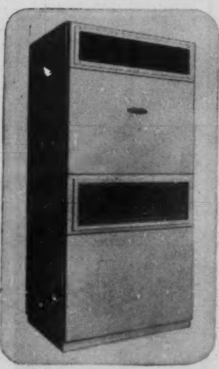
Reg. U. S. Pat. Off.

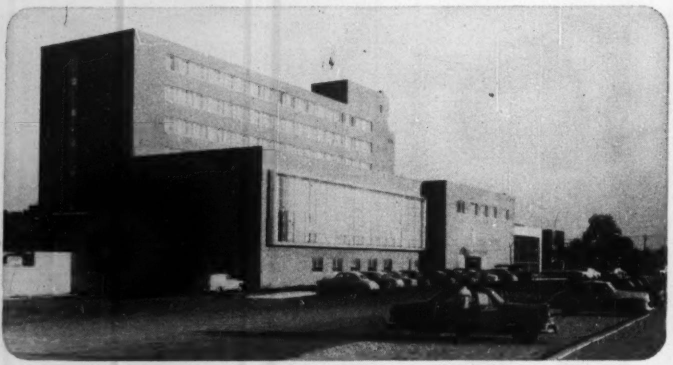
PACIFIC
Steel Heating Boilers
Detroit Michigan

Pacific Steel Boiler

DIVISION • UNITED STATES RADIATOR CORPORATION

GENERAL OFFICES: DETROIT 31, MICHIGAN





Fountain in the garden of the Student Union.

New Student Union Selects Air Conditioning & Refrigeration

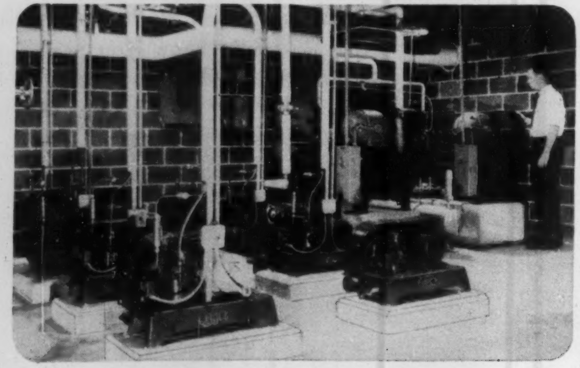
This fine building of the Indiana University Medical Center, at Indianapolis, comprises apartments, guest rooms, dining halls, shops, swimming pools, etc.

Here both air conditioning and food service loads are handled by 13 Frick refrigerating machines, and a Frick unit air conditioner. Seven fractional-horsepower units serve food-dispensing equipment, while four of 7½ horsepower each cool a dozen walk-in boxes. The Frick "ECLIPSE" machines operate a chilled-water air conditioning system. Installation by Hayes Bros., Inc., Distributors at Indianapolis and South Bend.

For that important cooling job of yours, specify Frick equipment: there's nothing to compare with it. Write now for Bulletin 100 on "ECLIPSE" compressors.

The book store, cafeteria, and other public spaces are all air conditioned.

Below: Some of the 11 Frick low-pressure units used for food service at the Student Union.

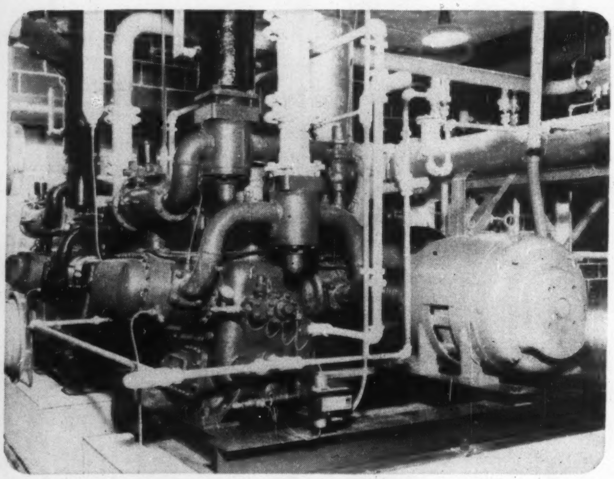


DEPENDABLE REFRIGERATION SINCE 1882

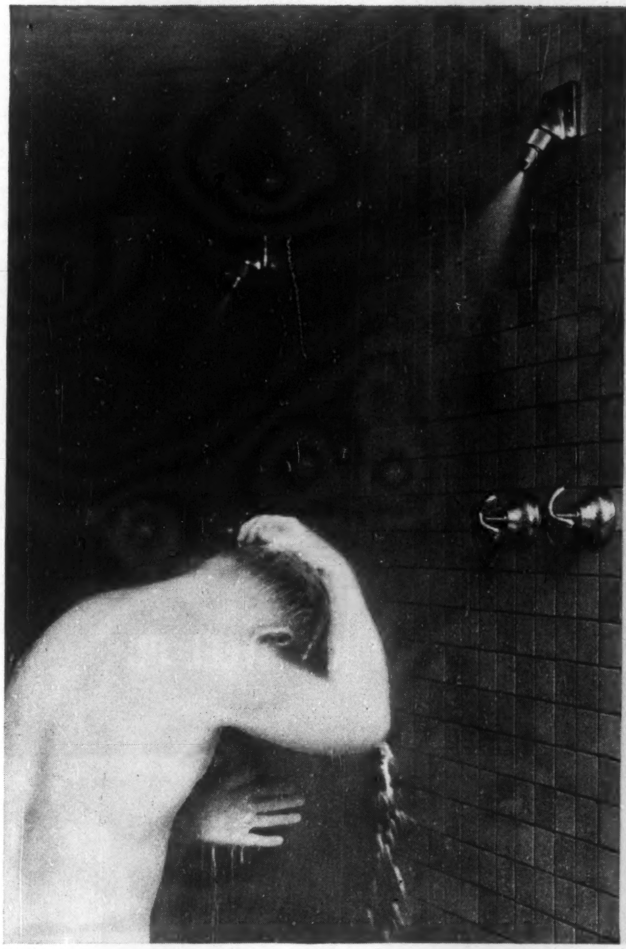
FRICK CO.

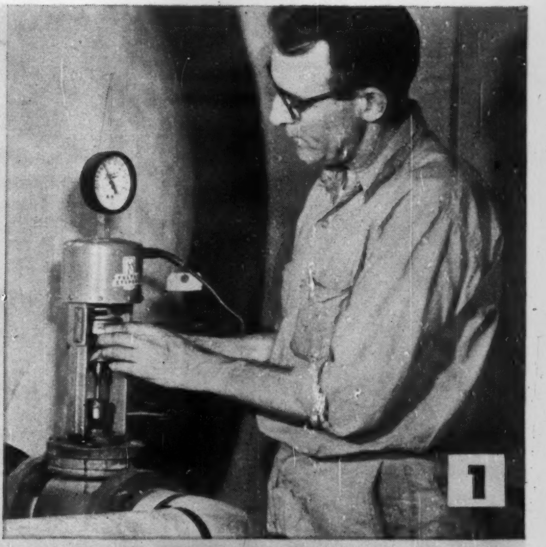
WAYNESBORO, PENNA. U.S.A.

Also Builders of Power Farming and Sawmill Machinery



Two Frick "ECLIPSE" compressors, each with nine cylinders, handle the air conditioning of public spaces in the Student Union at Indianapolis.





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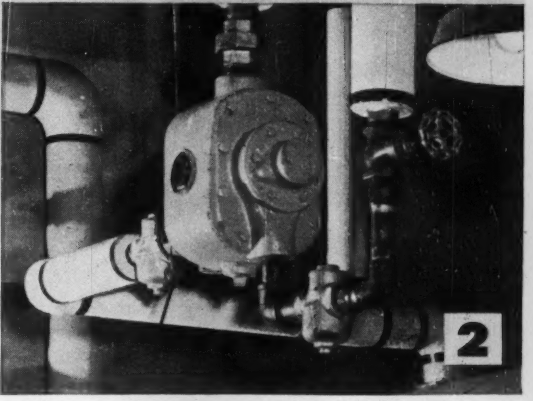


2

KEEP 'EM IN HOT WATER

Automatically controlled... money-saving, too

● Wherever a constant supply of uniform temperature hot water from storage is needed—showers, for example—Sylphon Controls handle the job dependably and economically.

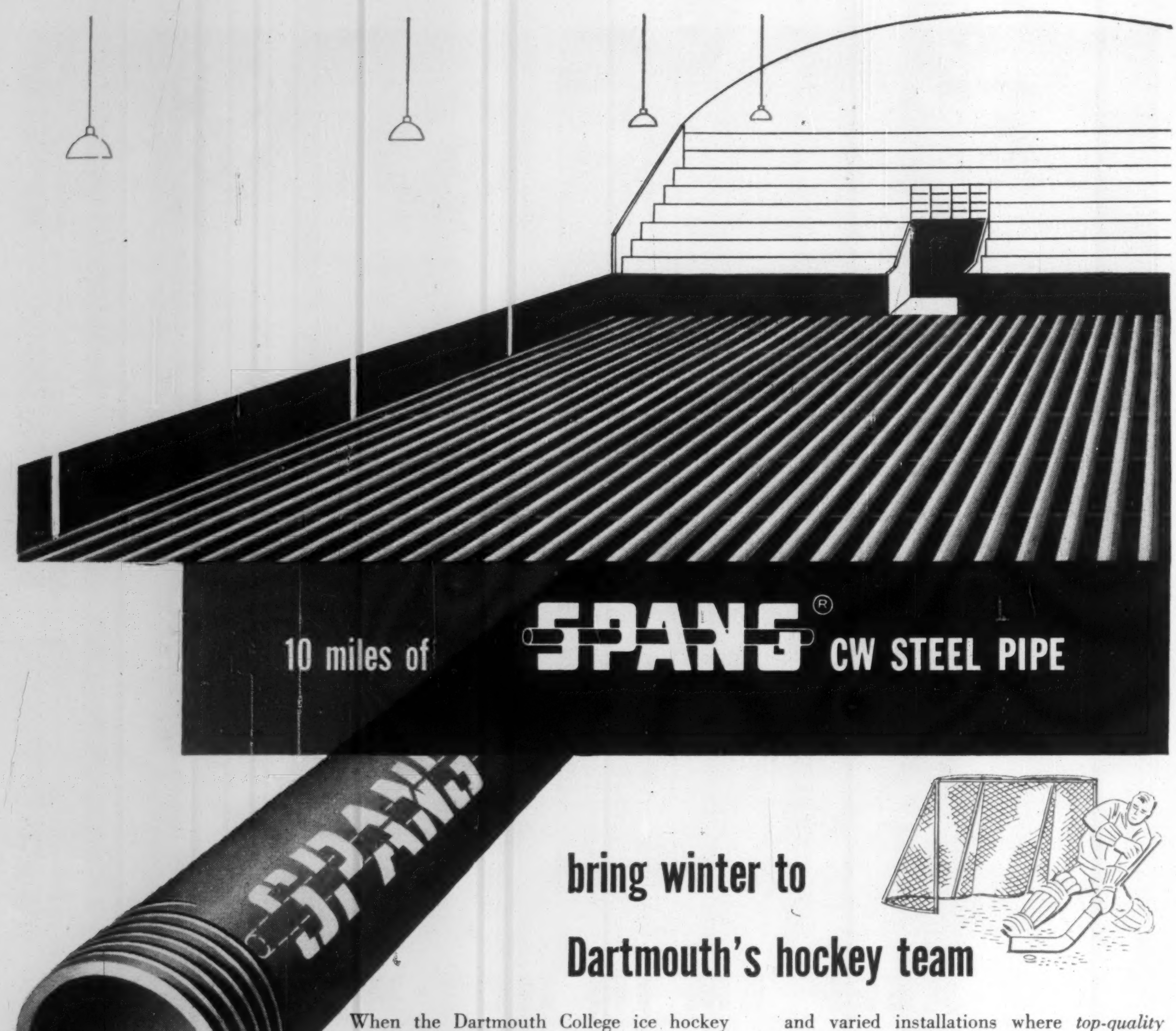
Pictured here (No. 1) is a Sylphon Temperature Regulator installed on a storage water heater. The regulator keeps the stored hot water at 180°F. for dishwashing and other services. Hot water from the storage tank goes through the Sylphon Water Mixer (Photo 2) which blends the hot water with cold water, limiting the temperature of the shower water and preventing scalding. The shower valves can be adjusted to get the shower water temperature desired.

The Sylphon Temperature Regulator No. 999-T is self-contained and self-powered; maintains constant, set temperature. The Sylphon Water Mixer No. 902 maintains temperature regardless of any fluctuation in supply water temperature or pressure. If either hot or cold water supply fails, this Mixer automatically shuts off the remaining supply—resumes flow when supply returns.

Sylphon Regulators like the storage water heater control pictured are used in apartments, hotels, factories, institutions, etc. Sturdily built to serve for years, practically maintenance-free. For information, write today for Catalog NH-D.

Robertshaw-Fulton
CONTROLS COMPANY

FULTON SYLPHON DIVISION • KNOXVILLE 1, TENN.


10 miles of SPANG® CW STEEL PIPE
SPANG

bring winter to Dartmouth's hockey team

When the Dartmouth College ice hockey team practiced for its big game with Harvard last season, nobody had to worry about the weather. It took 10 miles of *top-quality* SPANG CW Steel Pipe to do it . . . but now Dartmouth's skating rink has ideal ice conditions no matter how warm the weather.

In the new artificial ice system, made possible by contributions of alumni and friends, cooling brine is circulated through *top-quality* SPANG pipe by Frick ammonia refrigeration equipment. SPANG extra-heavy one-inch steel pipe, resting on steel supports and covered with sand, loops in parallel across the 16,000 ft rink area. Cold brine, pumped through the pipe, chills the sand so that water sprayed on its freezes immediately.

Here is just one more example of the many and varied installations where *top-quality* SPANG CW Steel Pipe is giving *top-quality* service. What gives SPANG that extra quality that makes it a top choice among leading contractors and architects? Only the best steel is used for SPANG CW . . . it's *quality-controlled* throughout manufacture . . . and the finished product is *doubly* inspected assuring you the finest pipe for heating, plumbing, air conditioning, radiant heating and snow melting systems. *Top-quality* SPANG CW Pipe is easier to cut, thread, weld and bend, making installation faster and keeping costs lower.

When you're buying pipe, specify SPANG CW Steel Pipe. Write for complete information and for the name of your nearest SPANG Distributor.

Owner:	Dartmouth College
Piping Contractor:	Frick Co., Waynesboro, Pa.
General Contractor:	Trumbull-Nelson Co., Inc., Hanover, New Hampshire

SPANG

SPANG-CHALFANT

DIVISION OF THE NATIONAL SUPPLY COMPANY

General Sales Office: Two Gateway Center,
Pittsburgh, Pennsylvania. District Sales Offices:
Atlanta, Boston, Detroit, Houston, Los Angeles,
New York, Philadelphia Pittsburgh St. Louis.

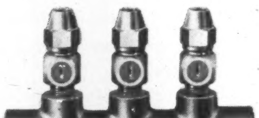
THRUSH QUALITY

pays dividends in time savings and customer satisfaction

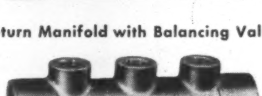
Balancing Valves *for Radiant Hot Water Heat*

THRUSH MANIFOLDS

Thrush Manifolds save time, space and fittings. 1" and 1¼" sizes, each with two, three or four ⅜" or ½" threaded branch outlets.



Return Manifold with Balancing Valves



Supply Manifold

GIVE ACCURATE CONTROL OF WATER FLOW, POSITIVE SHUT-OFF FOR AIR ELIMINATION

SAVE TIME and trouble in balancing radiant coils with these precision built Thrush Balancing Valves. Carefully made to give accurate control of flow. In eliminating air, the shut-off is positive. Flared fittings for ⅜" and ½" tubing. See your wholesaler or mail the coupon below today.

Mail Coupon Today!

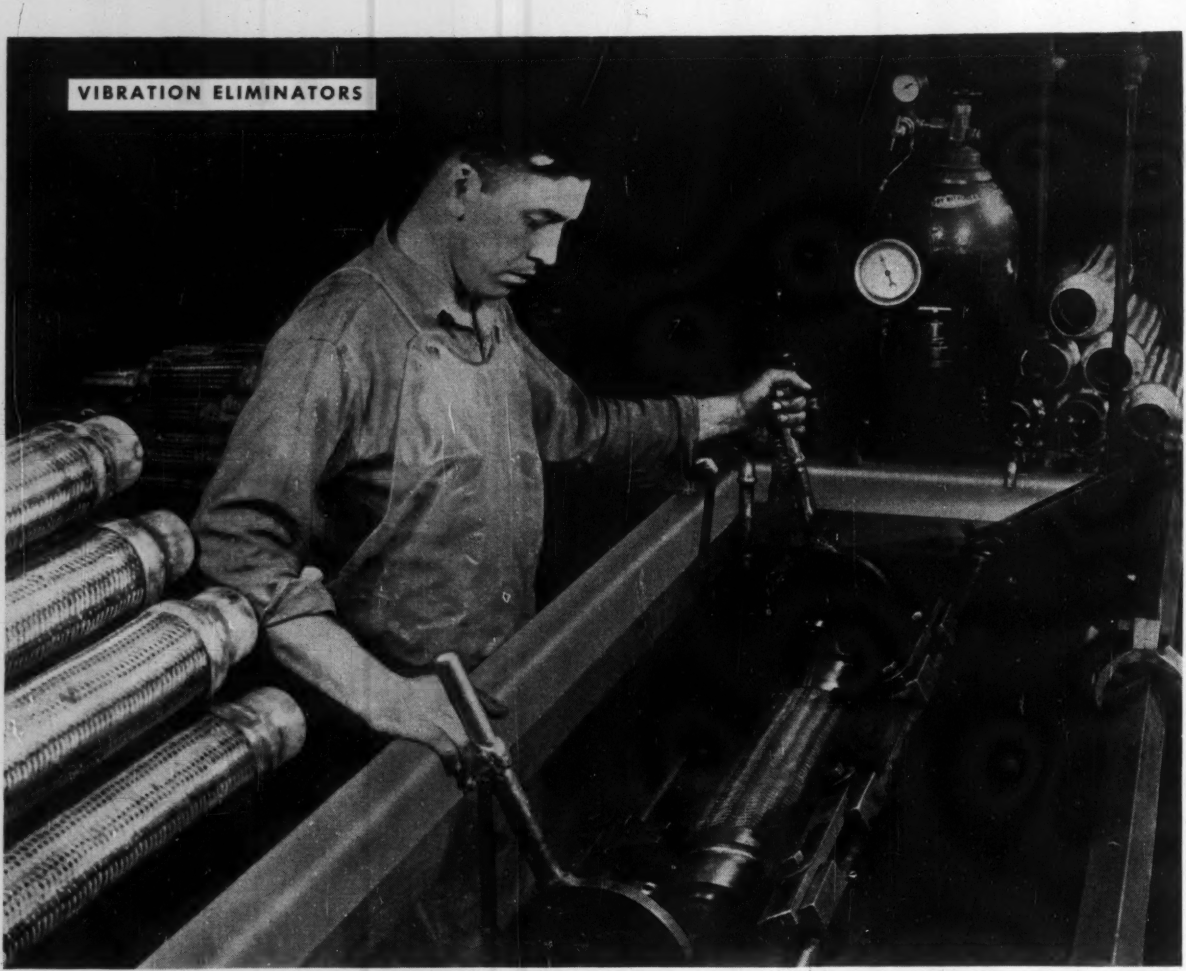
H. A. THRUSH & COMPANY, Department E-7, Peru, Indiana

Please send us illustrated bulletin on Thrush Balancing Valves and Manifolds.

NAME ADDRESS

CITY STATE

VIBRATION ELIMINATORS



Because freedom from leaks in refrigerant lines is so important . . .

Nitrogen—under pressure—searches for leaks in every American Vibration Eliminator

When you install an American Vibration Eliminator, it's leakproof and permanent. Here is why.

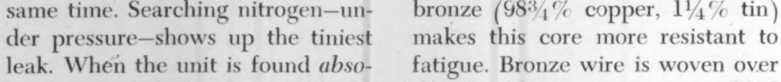
We test each Eliminator in tanks such as the one shown above—under pressure and under liquid at the same time. Searching nitrogen—under pressure—shows up the tiniest leak. When the unit is found *absolutely* free of leaks, then—and only then—we dry the Eliminator in a special oven and prepare it for shipment. Ends, of course, are sealed to keep the unit clean.

Only American Vibration Eliminators have the *seamless* core. They have no laps or joints where leaks can occur. High grade phosphor bronze (98¾% copper, 1¼% tin) makes this core more resistant to fatigue. Bronze wire is woven over the flexible core to give added strength for pressure duties.

To prevent cracked piping, isolate noise and vibration, use quality American Vibration Eliminators.

They are stocked in standard copper tube sizes by leading wholesalers. For descriptive Bulletin VE-310R write: *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.*

54228



WHEREVER CONNECTORS MUST MOVE

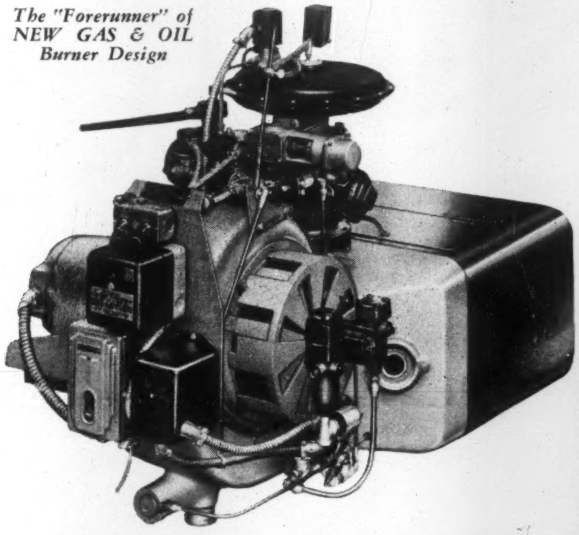
AMERICAN

flexible metal hose and tubing

an ANACONDA® product

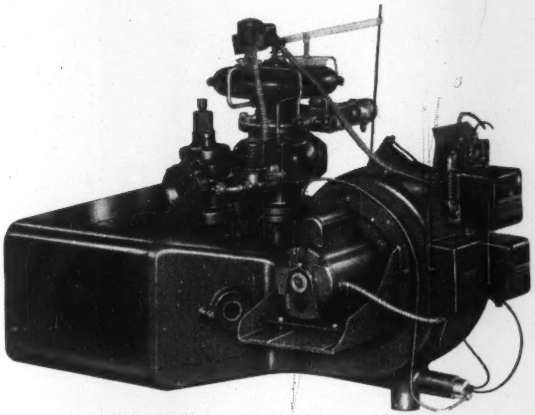
Mettler "FAN-AIR" AUTOMATIC MECHANICAL DRAFT "PACKAGED" GAS BURNERS

and Companion DUAL FUEL BURNERS



The "Forerunner" of NEW GAS & OIL Burner Design

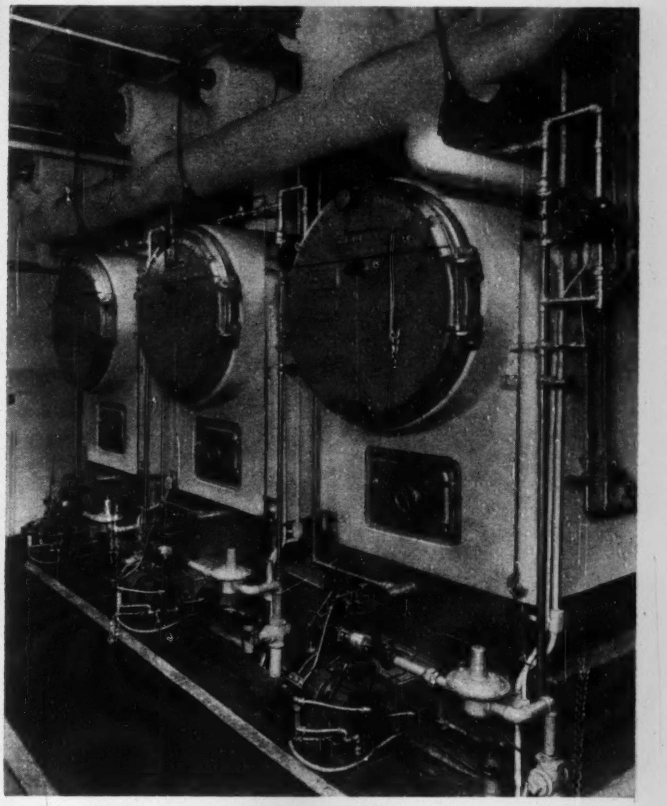
To clarify & emphasize exclusive features in adjoining pictured installation upper view represents 1954 Model MGO-5 (250 H.P.) embodying the unique Mettler Gas Burner Casting redesigned for adaptation of Oil, creating a major advance in DUAL FUEL BURNERS. Nothing else like it on the market. Any grade of Gas or Oil is usable. Write for Details.



Model 32F-3—Fan-Air Gas Burner—250 H.P.

New 1954 Model features automatic safety pilot and triple controls. Not just a burner, but a COMPLETE and FULLY AUTOMATIC GAS BURNER SYSTEM, factory tested and ready for application when received. Furnished complete as pictured; with simple dependable automatic "On and Off" or modulating controls. Burner and controls WITH SPARK IGNITION and FLAME SAFEGUARDS are scientifically coordinated to provide INSTANT FUEL SHUT-OFF on FLAME FAILURE — MEETING APPROVAL REQUIREMENTS. 12 sizes, 5 to 500 H.P.

Proudly pictured **(3) FAN-AIR MGO-3 DUAL FUEL BURNERS** replacing rotary cup (Oil & Gas) Burners in order to utilize Gas Fuel with utmost efficiency and safety factor. Note the compactness and flexibility of the **MGO BURNERS**, built to meet the need and trend of the Gas Industry. Not a hasty combination of old style burners but an entirely New Mettler design employing the **ENTRAINED COMBUSTION** principle with either fuel. The operational characteristics are sensational and unequaled by any other burners. A simple **"FLIP OF THE SWITCH"** transfers from Gas to Oil or in reverse. This user reports saving 33% with **GAS** as compared to former Gas usage. Name upon request.



A MODERN MECHANICAL DRAFT AUTOMATIC Combination GAS & OIL BURNER **SYSTEM.**

ALL BUILT ON THE *"Entrained Combustion"* PRINCIPLE • THE "FAN-AIR" MGO SERIES IS WORTHY OF YOUR SPONSORSHIP • PROMPT SHIPMENTS ASSURED • WRITE FOR DETAILS.

EXPERTO CREDE*

4366
WORTH STREET

THE **METTLER CO.** INC.

LOS ANGELES 63
CALIFORNIA

***TRUST ONE WHO HAS HAD EXPERIENCE — A RECOGNIZED TRADEMARK SINCE 1922**

To cut perfect threads

7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

Youngstown

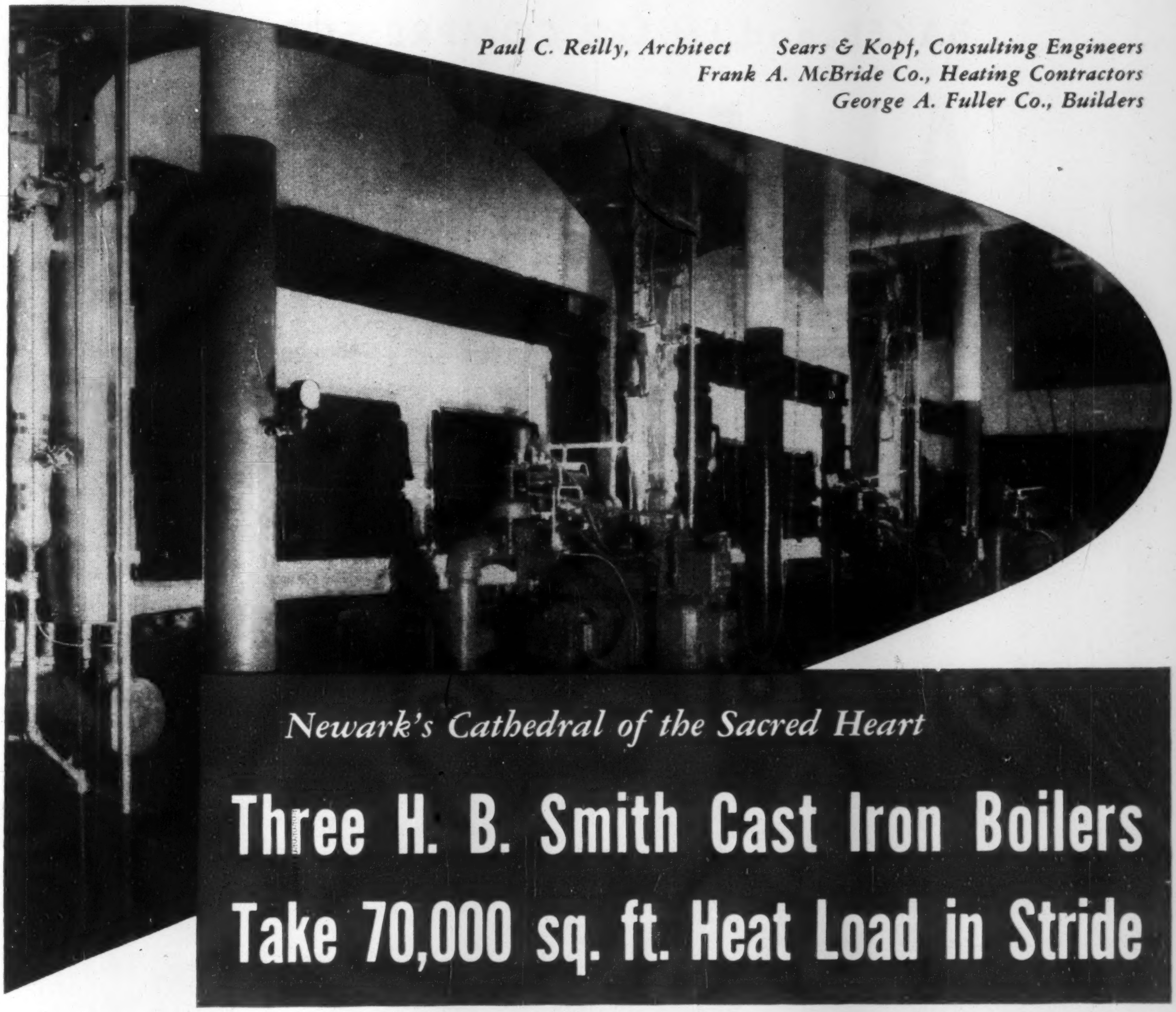
QUALITY
YOUNGSTOWN
SERVICE

●When the mechanical threader goes to work on Youngstown pipe, you can depend on it that the threads cut will be perfect and leak-proof. That's because the steel is of highest quality, controlled by a single manufacturer from ore mine to final inspection of the pipe.

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES



Paul C. Reilly, Architect *Sears & Kopf, Consulting Engineers*
Frank A. McBride Co., Heating Contractors
George A. Fuller Co., Builders

Newark's Cathedral of the Sacred Heart

Three H. B. Smith Cast Iron Boilers Take 70,000 sq. ft. Heat Load in Stride

The construction of The Cathedral, which started more than fifty years ago, posed a problem of heating and ventilating.

Requiring consideration were the great height of the nave and the large lateral occupied area which in addition to other spaces, totaled 70,000 square feet E. D. R. heating load. To supply the necessary heat and assure balanced distribution called for a high degree of engineering ingenuity — brilliantly met by Consulting Engineers Sears & Kopf.

Assigned to the task of heat generation were three H. B. Smith No. 60 Boilers — the largest three-boiler installation since the Company's founding in 1853. Each boiler consists of 30 cast iron sections, and each boiler is fired with power type gas burners. The over-all result is the comfortable heating of the huge interior. And, as is typical with the use of H. B. Smith Boilers, outstanding efficiency and fuel economy are achieved, with stack temperatures remaining consistently under 400°.

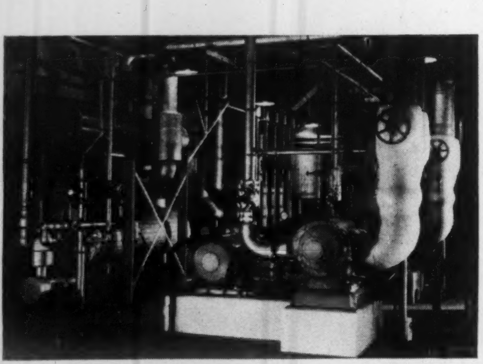
The H. B. Smith line of cast iron boilers for heating and domestic hot water permits a technical approach to any heating problem you may encounter. Broadest in the world, this line contains the concise, specific answer for small homes or multiple-unit applications.

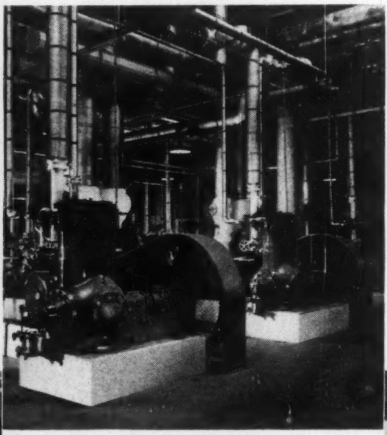
H.B. Smith **CAST IRON BOILERS**
THE H. B. SMITH COMPANY, INC., WESTFIELD, MASSACHUSETTS
Established 1853

BAKER and FULLER COMPRESSOR operated by

ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS


Three Fuller rotary booster compressors.


Four Baker Ice Machine Company compressors.

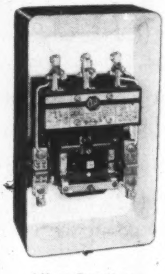
Baker and Fuller compressors controlled by Allen-Bradley at Continental Freezers of Illinois, Inc., Chicago.

Why are Allen-Bradley starters so popular for refrigeration and air-conditioning service? . . . Because they do not require regular attention—they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

No contact maintenance . . . Allen-Bradley double break, cadmium silver alloy contacts never need cleaning, filing, or dressing. Allen-Bradley thermal relays are dependable and remain accurate in their operation, even after long service.

The Allen-Bradley trademark stands for millions of trouble free operations. Install Allen-Bradley motor controls in your equipment, today, for rugged, reliable performance.

Allen-Bradley Co., 1335 S. First St., Milwaukee 4, Wis.


Allen-Bradley
Bulletin 709 Solenoid
Starter, Size 4.

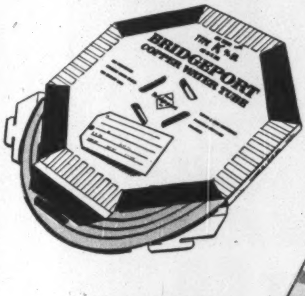
A-B
Quality

ALLEN-BRADLEY SOLENOID MOTOR CONTROLS

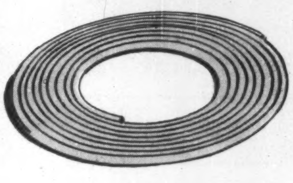
QUALITY MOTOR CONTROLS FOR HEATING, VENTILATING, AIR CONDITIONING, & REFRIGERATION INDUSTRIES

Introducing
BRIDGEPORT'S NEW COPPER WATER TUBE CARTON
with 5 improved features

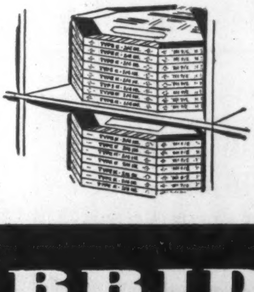
1. EASY TO OPEN
Quick-opening flaps for easy coil removal. No metal fasteners.

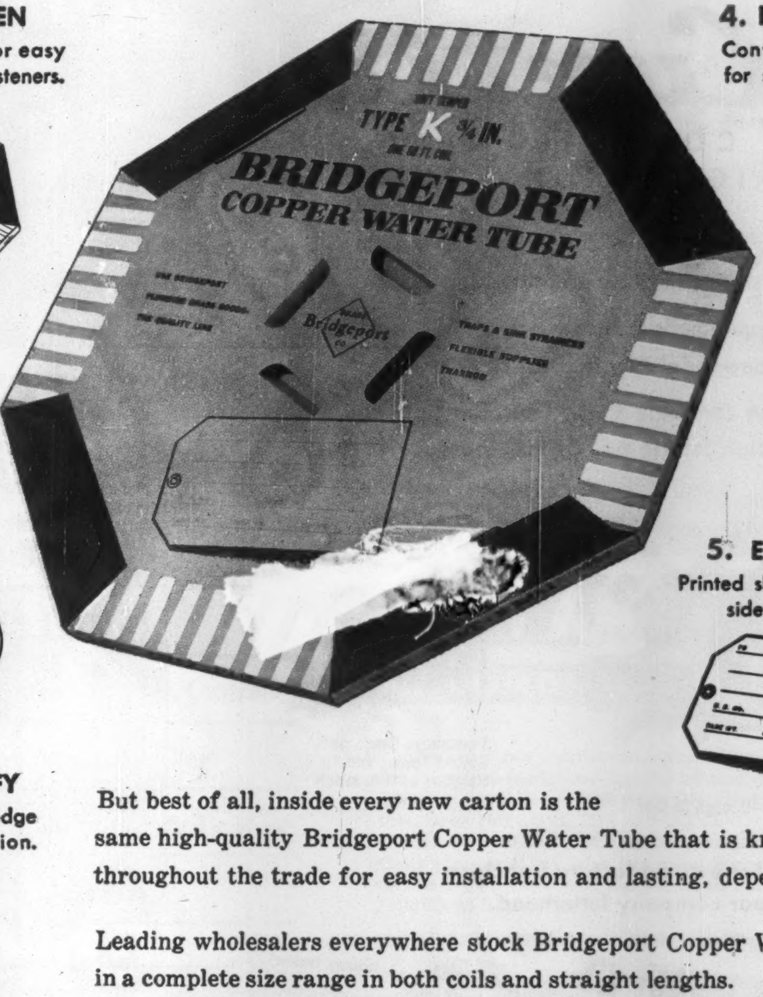


2. MORE PROTECTION
Stronger carton insures clean, undamaged tube to user.

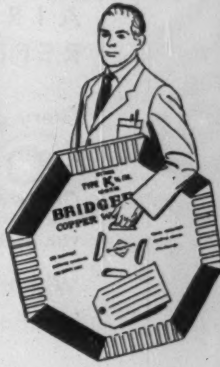


3. EASY TO IDENTIFY
Type and size marked on edge for quick shelf identification.

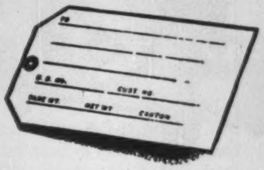




4. EASY TO CARRY
Convenient handholes for safe, sure carrying, lifting.



5. EASY TO RESHIP
Printed shipping label on each side for convenience.



But best of all, inside every new carton is the same high-quality Bridgeport Copper Water Tube that is known throughout the trade for easy installation and lasting, dependable service.

Leading wholesalers everywhere stock Bridgeport Copper Water Tube in a complete size range in both coils and straight lengths.

Made by the Producers of Bridgeport Plumbing Brass Goods

BRIDGEPORT BRASS
COMPANY ◆ BRIDGEPORT, CONNECTICUT

BRASS
Bridgeport
CO.

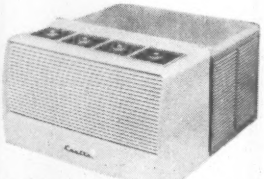
Sales Offices In Principal Cities—Conveniently Located Warehouses. *Mills at* Bridgeport, Conn., Indianapolis, Ind., and Adrian, Mich. *In Canada:* Noranda Copper and Brass Limited, Montreal

1854 · 1954
our 100TH year
OF SUCCESSFUL MANUFACTURING EXPERIENCE

YOU'LL SELL MORE PROFITABLE JOBS

with the complete line of Curtis

AIR CONDITIONING AND REFRIGERATION EQUIPMENT

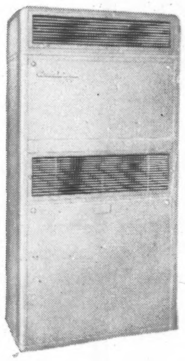


NEW 1954 Curtis Room Air Conditioner—an attractive, efficient unit with a BIG market potential

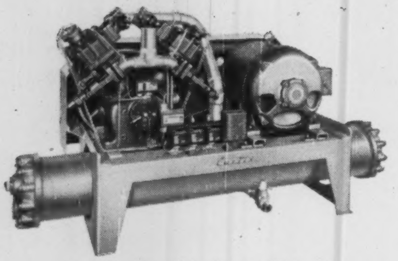
Every product in the Curtis line is built with quality material and workmanship.

Curtis equipment is known around the world for its dependability and efficiency.

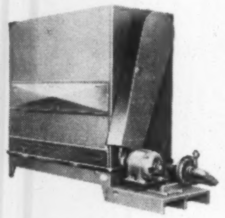
With the complete Curtis line, you can handle any installation for **Home, Office, Store,** or **Factory.**



Packaged Units—
2, 3, 5, 7½ and 10 tons
Choice of open or semi-hermetic compressors . . .
and 15 ton packaged
Central type units



Condensing units—through 80 tons



Evaporative Condensers, Cooling Towers and Air Handling units to match

Residential cooling and heating units

You may qualify for a direct factory franchise. Write us, using your company letterhead.

POST
TIME
Newsweek
house home

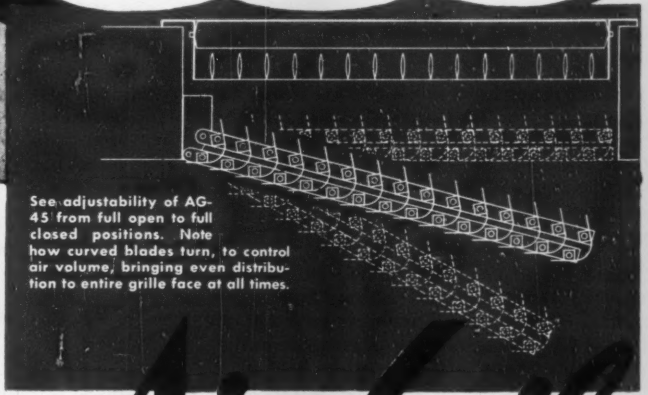
National advertising in *Saturday Evening Post, Time, Newsweek* and *House and Home,* plus many other publications helps sell Curtis to your customers and prospects. Attractive new sales literature is available to help you sell in your local area.

765

CURTIS REFRIGERATING MACHINE DIVISION
OF CURTIS MANUFACTURING CO.
1950 KIENLEN AVENUE
ST. LOUIS 20, MISSOURI

NEW ADJUSTABLE DOUBLE DUTY AIR VOLUME EXTRACTOR & CONTROLLER

FACTORY ASSEMBLY SAVES UP TO 50% OVER SLOW HAND-MADE METHODS



See adjustability of AG-45 from full open to full closed positions. Note how curved blades turn, to control air volume, bringing even distribution to entire grille face at all times.

11 TREMENDOUS ADVANTAGES:

1 FACTORY ASSEMBLED
2 INSTALLS WITH 2 SCREWS
3 Double Duty Extractor & Vol. Controller
4 Replaces Extra Vol. Controller
5 Equalizes Air Distribution & Air Flow
6 Turns Air from Main Duct
7 Reduces Pressure Losses
8 Stops Excess Turbulence
9 Low Cost
10 Rattle Free
11 14 & 20 Gauge Steel

Airfoil
AIR CONDITIONING OUTLETS

Slash unit costs with this amazing new Titus AG-45. Make it easy for yourself to *keep bids low.* Use this *cost saver* to beat competition. Eliminate the extra work of putting in volume controllers. Save time, labor. IMPROVE THE AIR CONTROL EFFICIENCY OF EVERY INSTALLATION. Get complete free information now. Order a sample AG-45 today. Remember, not until you have one of these AG-45s in your hand, can you see its *amazing cost-saving value.* IMMEDIATE DELIVERY.

Free

Check Type of Grille on Which Information Is Desired:

☐ Air conditioning outlets
☐ Return air grilles and registers
☐ Volume controllers
☐ Perforated metal and ornamental grilles
☐ Industrial grilles
☐ Special made-to-order grilles.

TITUS MANUFACTURING CORP., WATERLOO, IOWA

☐ RUSH information on AG-45 Extractor & Controller
☐ Send complete catalog
☐ Send literature on above checked items

NAME ____________________
ADDRESS ____________________
CITY ____________________ STATE ______

Meet the Tubes that Meet Your Needs

B&W Seamless and Welded Carbon, Alloy and Stainless Tubing for Condensers and Heat Exchangers

CARBON STEEL

This grade is used where service conditions are mild, that is, where the temperatures involved are relatively low and corrosive attack is not anticipated.

LOW CHROMIUM STEELS

The addition of chromium and molybdenum give these alloys good strength at elevated temperatures and improved resistance to oxidation as well as resistance to deterioration in services involving some hot corrosive gases.

INTERMEDIATE CHROMIUM STEELS

These grades have applications similar to those of the low chromium group except the additional alloying elements improve their characteristics and permit higher operating temperatures. They are particularly adapted to the handling of oils or hydrocarbon fluids containing sulphur compounds.

NICKEL STEELS

These steels are particularly suited for handling neutral salt solutions such as sodium and potassium nitrate or sulphate. They have found service in the black liquor evaporators of soda and kraft paper mills. Another field of application has been in sub-zero temperature service where high impact resistance is also a necessity.

STAINLESS STEELS

These steels are for specialized application where service conditions are extreme, that is, where corrosive environments or high temperatures are problems. The stainless steels have wide usage in the chemical industries, petroleum refinery, paper making, drug preparation, food processing and dairy and beverage industries.

For sound assistance in meeting your specific tubing requirements, write for Bulletin TB-329A or, better yet, get in touch with Mr. Tubes, your link to B&W. He represents B&W's headquarters technical staff and strategically located district offices, and B&W's nationwide network of fine tubing distributors.

B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
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TA-4044(CWP)

THE EDITORS' PAGES

• *POLITICAL PREDICTION: As it did during the 1952 political conventions, air conditioning will be very much involved in the nominations of our next candidates for President. Chicago, of course, has the air conditioned International Amphitheatre, where both the '52 conventions were held. Cleveland and Philadelphia are air conditioning their halls. Air conditioned facilities are "musts" for any city hoping to get the conventions . . . . and the race is already on.*

ONE OF HPAC's advertising representatives, Robert J. Osborn, lives in Connecticut — where letters instead of numbers may be used on automobile plates. The license for his car publicizes Heating, Piping & Air Conditioning

Predicts Air Conditioning of "Whole Cities"

. . . from central plants

AN AMERICA in which whole cities will be air conditioned from central plants was pictured as possible "within the lifetime of many of us" by Cloud Wampler, president of Carrier Corp., in a recent address before a meeting of the Investment Bankers Association of America (during which he forecast that annual sales of the air conditioning industry at the retail level would reach $5 billion within a decade.)

"I see also an America of windowless air conditioned factories, of air conditioned streets and air conditioned homes," he said. "I am very sure that, long before this century is ended, there will be few if any homes built in this country that will not be completely air conditioned."

Develop Standards for Plastic Pipe, Fittings

. . . SPI group meets

DIMENSIONAL standards for SWP butyrate plastic pipe were discussed at a meeting of one of the committees of the Society of the Plastics Industry during the SPI 1954 annual conference held in Cleveland last month. (SWP means solvent welded pipe.) Standards for polyethylene pipe are also in process.

A joint committee of the American Society for Testing Materials and the SPI has just been organized to develop test methods for plastic pipe and fittings. Also under progress—and reported some time ago in HPAC—is the research study at Battelle Memorial Institute on test methods for bursting strengths, safe working pressures, long-time serviceability, etc., of plastic pipe.

Of the record 3 billion lb of raw materials produced in the plastics industry in 1953, it is believed that some 20 million lb went into polyethylene pipe and fittings, 4 million lb to butyrate pipe and fittings, and 2 or 3 million lb to other types of plastic pipe and fittings.

At a general session of the conference, John R. Hertzler, of the York Corp., discussed the use of plastics in window air conditioners. He pointed out that both air conditioning and plastics are "growth industries."

The national plastics exposition—with a record number of exhibitors and a high attendance—was held in Cleveland the same week as the conference.

Big Increase in Power Demand Seen

. . . air conditioning grows

ELECTRIC POWER — already at a record level of 257 billion kwhr — will increase another 55 percent within the next 10 years, it was predicted recently by Tomlinson Fort, vice president, Westinghouse Electric Corp.

Citing the "phenomenal" growth of the air conditioning market, Mr. Fort revealed last year's demand jumped to 13.8 billion kwhr, and the estimated power consumption in this field would reach 45 billion kwhr within nine years.

Air Conditioning Without Ducts

. . . chilled water used

WHEN SELECTING the air conditioning system for the 333 Logan Building in Denver, some definite desires of the building's owner were kept in mind. The system had to provide automatic heating and cooling and positive mechanical ventilation without the use of ductwork that would possibly transmit noises from one office to another.

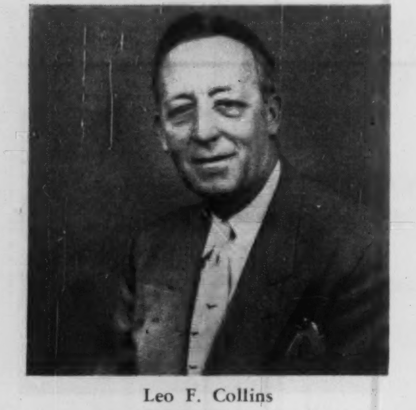
These desires were met by installing some 50 individually controlled year-around units that use hot and chilled water to heat and cool a mixture of outdoor and recirculated air, according to The Trane Co. Each wall unit operates independently of the others. Refrigeration is supplied by a 40 ton compressor used in conjunction with an evaporative condenser.

$16 Billion To Modernize Plant Facilities, Equipment

. . . forecast for '54

AN ESTIMATE that more than $16 billion will be invested by U. S. industry this year to modernize plant facilities and equipment was made at a meeting of the Instrument Society of America by Henry F. Dever, president of the Brown Instruments Div. of the Minneapolis-Honeywell Regulator Co. He said that this amount of money — roughly 60 percent of the estimated $27 billion slated for capital expenditures in 1954 — would be needed to combat technological obsolescence and to sustain industrial growth.

In the long run, Mr. Dever said, the "real basis for growth — for both small and large corporations — lies in the steady flow of new production ideas implemented by investing in better equipment and new processes."


Leo F. Collins

Leo F. Collins Named NDHA's President

. . . HPAC contributor

LEO F. COLLINS, safety supervisor of the central heating department of The Detroit Edison Co., a member of HPAC's board of consulting and contributing editors, and author of a number of articles that have been published in HPAC, was elected president last month of the National District Heating Association.

A report of the NDHA convention, held at White Sulphur Springs, W. Va., by John F. Collins, Jr. (no relation to the new NDHA president), secretary-treasurer of the association, is to be published in HPAC.

Problems of Increasing Water Demands Discussed

. . . at pump plant dedication

HIGHLIGHTED RECENTLY at a forum on the problems arising from increasing water demands in the U.S. were the role of research, and the need for further education in the technical fields. Dr. Francis M. Dawson, chairman of the technical forum held in connection with the opening of the new Fairbanks, Morse & Co. pump works in Kansas City, Kans., noted that Russia, although generally considered to be well behind the U.S. in general education, is educating twice as many technical people as this country.

Dr. Dawson, dean of the college of engineering, State University of Iowa, pointed out that, while the education received in the technical fields in Russia may not be as complete as that possible in the U.S., their emphasis is being placed on having a large group capable of conducting research vital to both peaceful and non-peaceful activities.

Following the same thought, Dr. Richard G. Folsom, director of the engineering research institute, and professor of mechanical engineering, University of Michigan, said that the stockpile of ideas in the U.S. is dangerously low. Speaking particularly of the problems facing the forum, Dr. Folsom said that there were four important facts to remember:

a) Hydraulic engineering and, in particular, centrifugal pumps have an important future,

b) Research has a large and important role in that future,

c) Success in research depends primarily on men, and

d) Success of men in research depends upon close cooperation of industrial companies and educational institutions.

The panel session of the forum, under the moderation of Dr. Robert T. Knapp, professor of hydraulic engineering, California Institute of Technology, discussed what has happened in the field of centrifugal pumps in the past 25 years and what the future holds in store.

Taking part in the forum discussion, in addition to Dr. Knapp, were seven leaders in the field of hydraulic engineering from both education and business.

Aladar Hollander, emeritus professor, California Institute of Technology, said that in the last 25 years "we have learned a lot but don't know very much yet." He noted that pumps being produced today have greater efficiency, are built of better materials, and operate at a higher speed, but that the advances have been "primarily in the general application of knowledge which we already had."

"Quote"

"The past few summers in Chicago (as elsewhere) have been extremely warm — and, of course, last year broke all records. The demand for air conditioning actually prompted the planning of our expanded air conditioning program.

"The trend today indicates that more and more people will be requiring air conditioning, not only in the warm summer months but during such months as they may be bothered with hay fever and the like." —— *William J. Burns, General Manager, Congress Hotel, Chicago, in a recent letter to Heating, Piping & Air Conditioning.*

Discussing the overall future of the centrifugal pump business, C. P. Lindner, chief engineer, South Atlantic Div., Corps of Engineers, Dept. of the Army, said that the ever present demand is for bigger and more efficient pumps. "The demand," he said, "will force manufacturers to produce pumps much larger than those of today."

Speaking at a luncheon following the forum session, Gail A. Hathaway, past president of the ASCE and now special assistant to the Chief of Engineers, said that the per capita use of water in the U.S. has quadrupled since 1900.

"From 1900 to 1950 the population had doubled and the use had grown from 500 to 600 gallons per day per capita to 1100 gal per day," he said. "The total withdrawal in 1950 of fresh water was 170 billion gal per day, or one-eighth of the total yield of the nation's streams and aquifers. In 1950, direct withdrawal by industrial firms was 65 billion gal per day of fresh water and 15 billion gal per day from brackish or salty sources."

Speaking of the future, Mr. Hathaway said that "with the constantly rising standard of living and the increasing per capita consumption of raw materials, we may expect the demand for the nation's water supply to be doubled again from 1950 to 1975. In fact, water supply may be the most important factor affecting industrial location.

"It must be recognized that the narrowing margin between the present water supply and the amount ultimately available is going to require more knowledge, better engineering and increased consideration of complicating factors on the part of water users."

The technical forum was held on the second day of a four-day program dedicating the newest plant of the Fairbanks, Morse & Co. Geared to an annual output of enough pumps to move 35 billion gal of water or other fluids per day, it boasts one of the nation's most modern foundries and a manufacturing department which occupies 180,000 sq ft.

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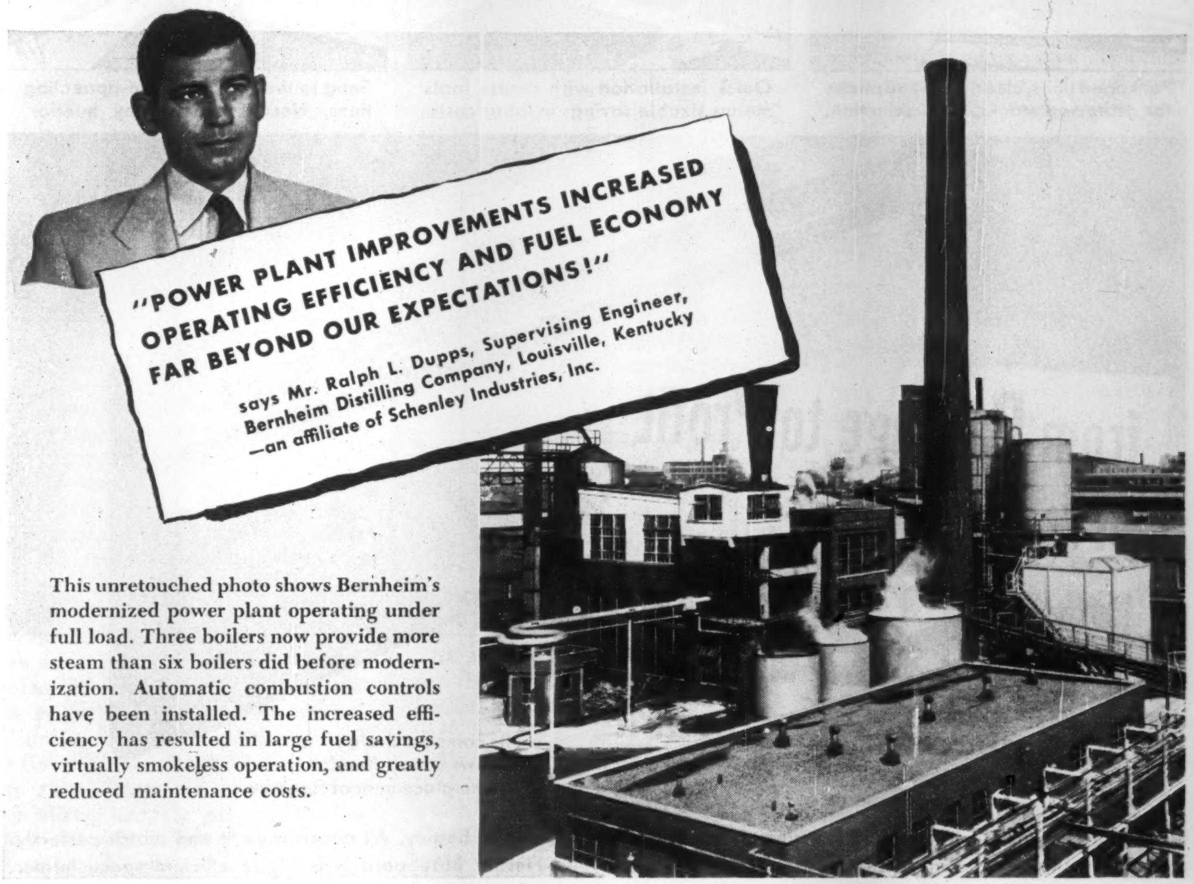

"POWER PLANT IMPROVEMENTS INCREASED OPERATING EFFICIENCY AND FUEL ECONOMY FAR BEYOND OUR EXPECTATIONS!"

says Mr. Ralph L. Dupps, Supervising Engineer, Bernheim Distilling Company, Louisville, Kentucky —an affiliate of Schenley Industries, Inc.

This unretouched photo shows Bernheim's modernized power plant operating under full load. Three boilers now provide more steam than six boilers did before modernization. Automatic combustion controls have been installed. The increased efficiency has resulted in large fuel savings, virtually smokeless operation, and greatly reduced maintenance costs.

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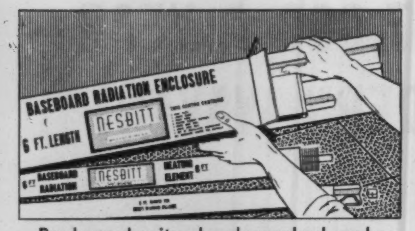
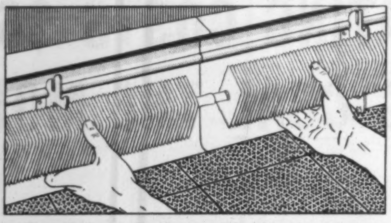
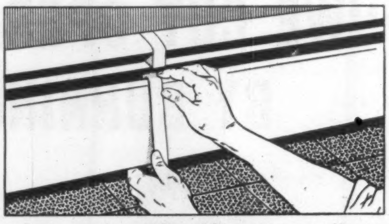


Packaged units, clearly marked, make for protected stocks, easy selection.



Quick installation with simple tools means sizable savings in labor costs.



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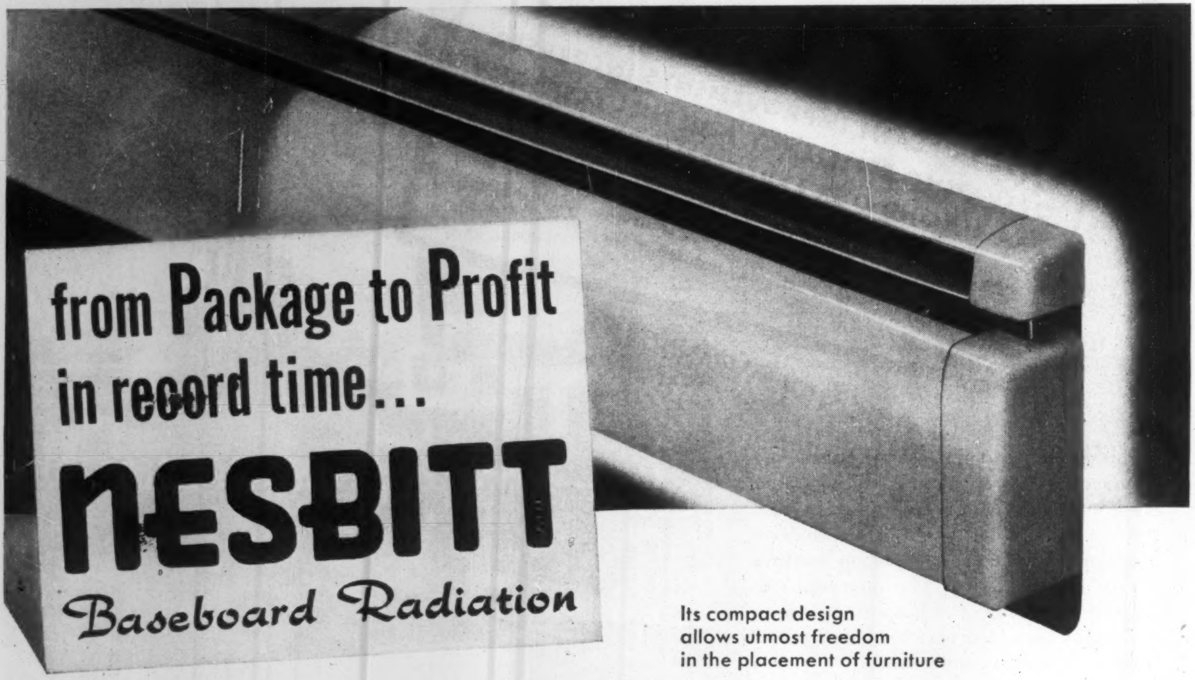

Its compact design allows utmost freedom in the placement of furniture

Before developing this high-capacity system of perimeter convector radiation, Nesbitt studied your installation problems and designed Nesbitt Baseboard to simplify every step, every required movement. Now greater profits may be yours through the time-and-labor-saving installation of Nesbitt Baseboard Radiation.

Nesbitt Baseboard comes in standard lengths of four, six, and eight feet with enclosure, heating element and damper packed separately. This permits exact combinations of material to meet each job requirement. Joint trim, wall sections, end caps and corner pieces are available to fit every condition. All accessories come individually packed for easy handling. The economies of precise purchasing and damage prevention are appreciable.

Installation is simple. Nesbitt Baseboard heating element tubes have mated ends for jointing without fittings. The easily attached casings have no exposed screws to mar their beauty. All accessories fit and match perfectly.

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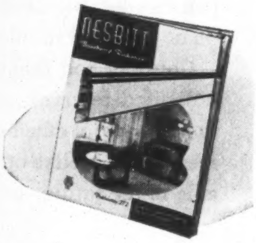

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J. C. BECKETT —

"What About Other Effects of Sterilizing Lamps?"

THE ARTICLE by R. Nagy, G. Mouromseff and F. H. Rixton, entitled *Disinfecting Air with Sterilizing Lamps*, published in the April HPAC, was of considerable interest and I am sure a great help in furthering this application. However, the authors did not mention three factors that may be of major importance.

The amount of ozone produced in sterilizing lamps is assumed by many to be insignificant, but this is generally not the case, particularly where the background ozone concentration is relatively high. For example, the Stanford Research Institute has found an abnormally high concentration of ozone in the air in Los Angeles that is generally associated with air pollution. If even a relatively small amount of additional ozone is added to this background by the use of sterilizing lamps in air conditioning, will not this be a serious threat to health and comfort?

Also, no mention is made of the ionization of the air as a result of using ultraviolet radiation. No doubt ions of both polarities are generated, but have any measurements been made to determine the magnitude and the degree that one polarity exceeds the other? There appears to be increasing biological evidence that air conditioning engineers should not inadvertently alter the atmospheric ion density without some degree of control. What have been the findings on change in ion density as the result of the use of sterilization lamps?

Another point that may be worth consideration is that the author discussed the use of Petri dishes to determine the effectiveness of ultraviolet lamps in air ducts. It has been my experience that Petri dishes are not necessarily the best means of testing, inasmuch as they catch only the relatively large spores of bacteria which "fall out" of the air. Have the authors done any work with molecular filters in an effort to sample all living organisms that may be present or destroyed by ultraviolet radiation?

All considered, the authors have done an excellent job in improving the application of ultraviolet radiation from sterilization lamps in air ducts, but the bacteriological and biological phase of this research project should be thoroughly investigated prior to general application of the equipment. Perhaps this has been done, but I have never succeeded in locating satisfactory references.—J. C. BECKETT, Chief Engineer, Wesix Electric Heater Co.

THE AUTHORS' REPLY — Thank you for the opportunity to answer Mr. Beckett's questions regarding our paper.

Mr. Beckett has pointed to factors in the application of sterilizing lamps which have been considered but not discussed in our paper. As an example, the amount of ions generated by ultraviolet lamps was of interest, not only from the standpoint of their possible physiological effects, but also for the purpose of determining if ultraviolet lamps could be used for the dissipation of electrostatic charges in various industries. The ionization potentials of oxygen and nitrogen are 12.4 and 15.5 electron volts, respectively. Sterilizing lamps, or even quartz ultraviolet lamps, do not emit radiations of this energy so that copious ions could not be produced. Ions which have been reportedly produced by ultraviolet lamps may have resulted from the charging of dust particles having a much lower ionization potential than air. Using an electroscope and a sterilizing lamp, we could not detect ions of either polarity.

The amount of ozone generated by ultraviolet lamps is controlled by the thickness and composition of the glass envelope. This controlled amount of ozone is used to destroy micro-organisms, as in meat rooms, or to destroy odors in air conditioning systems. The amount of ozone introduced into rooms under such conditions is of the order of 0.05 ppm. Low ozone lamps would produce less than this amount. The amount of ozone reported by A. J. Haagen-Smit for the Los Angeles area under smog conditions was as high as 0.22 ppm. This amount, which is about five to 10 times the normal air concentrations, has not been shown to be detrimental to man. Smog contains oxides of nitrogen, sulphur dioxide and organic compounds which probably are responsible for most of the physiological reactions.

The sampling of organisms from an air stream or in a room is difficult and erroneous results can be obtained if precautions are not taken. Our paper not only showed the use of Petri plates, but also the centrifuge and electrostatic collector. The bacteriological phase of this work has been discussed in references 4 and 7 of our paper. The biological phase of this work has been thoroughly investigated by many others during the past decade. It has been shown that respiratory diseases can be reduced by the use of ultraviolet lamps. It would be desirable if more data would be published on the numerous installations that already are in the field.—DR. RUDOLPH NAGY, Research Dept., Lamp Div., Westinghouse Electric Corp.

E. E. DUBRY —

"Corrosion and Other Costs Can Be Reduced"

REFERRING to the article, *District Heating Progresses in the Last 25 Years*, by John F. Collins, Jr., in the June HPAC, the following comments may be of interest to HPAC's readers.

Field investigations indicate that any warm, humid atmosphere, such as is common in most underground steam distribution systems, will cause severe corrosion of ferrous metals. This is the cause of failure due to corrosion of ferrous pipe supports and rollers, which in time creates an expensive maintenance job. Changing these materials to stainless steel increases the original cost slightly but extends the life of the underground main. Inspections of the corrosive condition of pipe supports that are 40 or more years old lead us to estimate the life of the new construction using stainless steel to be at least 100 years.

Since many district heating plants have a high or, in some cases, a 100 percent boiler feedwater makeup, changing water treatment from an internal process to an external process has eliminated boiler outages due to boiler scale. The addition of deaerating equipment to these plants has produced a feedwater practically free of scale, carbon dioxide and oxygen. This improvement in water treatment has reduced unscheduled boiler outages and will reduce the number of spare boilers required on the system. Reducing capital costs also reduces the cost of producing steam.—E. E. Dubry, General Superintendent of Central Heating, The Detroit Edison Co.

A. G. VOGEL —

"Article on Fuel Oil Comparisons Valuable"

The article, *Use Light or Heavy Oil?*, by Robert I. Anderson, published in the April HPAC, is very comprehensive and instructive. I have found the article to be particularly helpful since it includes actual installation costs and data which most articles omit.

As a rule, authors are thoroughly satisfied to generalize by vaguely indicating that a certain method would cost more or less than another. Mr. Anderson brought out concrete cost data, which is valuable.—A. G. Vogel, General Manager, Rempe Co.

OWEN S. LIEBERG —

"I Would Like to Comment on HTHW"

I would like to make one comment on the article on HTHW systems, by S. A. Kuli, which was published in the February HPAC. This comment is only about the statement that Mr. Kuli makes on page 87; that is: "However, when steam is drawn from the boiler and thus more make-up water is needed. ."

It is my experience and that of many others that water should never be drawn from the high temperature hot water system in the form of steam or allowed to flash in any way. More troubles have been caused by combining high temperature hot water generation with steam generation than are generally realized. In fact, one installation was a complete failure because, in spite of an excellent feedwater treatment, the small piping on the high temperature hot water side became choked with scale deposits because of steam being drawn off and make-up water being added. If steam is required, an indirect heat exchanger is the most economical and efficient form of steam generator for this type of application. — Owen S. Lieberg, Mechanical Engineer.

JOHN H. CLARKE —

"Would Like to Emphasize Industrial Ventilation"

The article that describes the design features of the new automotive laboratory by Norman R. Olson, which was published in the April HPAC, was most interesting. Having had a part in the design of the heating and ventilating systems for the building, I was particularly interested. From the viewpoint of the industrial ventilation engineer, several of the design features mentioned by Mr. Olson are worth emphasizing. The ventilation for the building is balanced throughout in order to eliminate the problems encountered with infiltration, drafts, and faulty removal of fumes caused by lack of make-up air.

It is of interest to note that all of the fume exhaust systems in this new laboratory discharge through straight stacks, without weather caps. The stacks are extended well above the roof to minimize the possibility of fumes being drawn back into the building. For systems that operate continuously and discharge at a reasonably high velocity, no rain will enter such a stack. The effluent will also be diluted and discharged in a manner which will minimize the possibility of objectionable toxic concentrations in the area. Model tests have indicated that the desirable height for such a stack at the side of a one or two story structure is about 1.5 to 1.75 times the building height.

For systems which operate intermittently, vertical discharge and rain protection may be provided by means of a stack with a drain at the base or by the use of a telescoping section at the top. This will permit the rain to drain to the outside instead of down the inside of the stack. Double cone weather heads can also be used for this purpose but are more expensive to manufacture.

Unexpectedly good control of the air temperature was obtained in the dynamometer room by positioning the directional supply outlets so as to induce rotational air movement around the periphery of the space. Because the inside wall at the shop end of the dynamometer room was the only location which was in any way suitable for a thermostat, the operating personnel had been warned that considerable temperature variation should be expected between the ends of the room. However, in actual operation, very little temperature difference was experienced.

The directional outlets in the dynamometer room are also worth noting. They are a variation of the Navy type "E" outlets that are used on warships. In areas such as this, air movement at the worker is very desirable in the summer, but it cannot be tolerated in cold weather. It is necessary, therefore, that such outlets be directional, so that the air may be directed toward the worker in the summer and directed up out of the occupied zone in the winter. Volume control should also be provided in most cases.

The use of these outlets for the area illustrates one of the fundamental principles of industrial ventilation — that the problem should be treated where it occurs. This is a well established principle for industrial exhaust, and it is equally true for supply systems for warm and hot areas. It is essential in each problem of this sort that the heat load for the working area be carefully evaluated and that every practicable step be taken to reduce the heat load by change of process, use of different equipment or design, or by addition of insulation. Where radiant heat is present, this load can only be reduced by shielding. In the case of the dynamometer room, the operators, for flexibility and other reasons, did not wish to enclose the test stands, nor did they wish to use portable enclosures. Considerable heat was removed, however, by means of a water cooling system. To provide satisfactory summer ventilation for such a space, it is necessary to provide air movement at the worker at a temperature that will aid in removing body heat by evaporation and convection. For this reason, the outlets should be as close as possible to the personnel. In warm or hot areas — where it is not practicable to air condition or cool the entire area — the terms "air change" and "temperature rise" are meaningless, except as guides in checking the design. Consequently, outlets located high in a space and discharging in a conventional manner are of little value.

New material in this field has been included in the 1954 edition of the ASHVE *Guide*, and it is recommended that ventilation engineers interested in industrial ventilation study this material and the included references. — JOHN H. CLARKE, Engineering Supervisor, The Visking Corp.

W. R. LAWTON —

"Would Like to Comment on Pipe Coating Article"

WE WERE very much interested in reading the article, *What's New in Pipe Coatings* by George D. Lain, published in the January HPAC.

We would like to offer some comments on this article. We feel that the article should have mentioned some of the problems that are involved when corrosion attacks threaded and coupled joints.

We would also take exception to the recommendation of pickling and a phosphate dip as a surface preparation for metal. It is our opinion that sand blasting is the best possible metal preparation prior to coating.

For truly severe corrosive conditions we feel that it is doubtful that a film thickness of five or six mils would prove to give adequate protection. It has been our experience that coatings of the cold set type can be applied up to twice the film thickness per application than the baked type. We have also found that the cold set type of coatings have the same or a better temperature tolerance than the baked phenolics and also that they have a much higher temperature tolerance than vinyls.

We would like to recommend the inclusion of catalytically cured coatings in this program. We sincerely trust that our suggestions and comments will be accepted in the same manner that they are given and, of course, if Mr. Lain would like to have us elaborate on any of these suggestions, we will be very glad to do so.—W. R. LAWTON, Research Director, The Ric-wiL Co.

THE AUTHOR REPLIES — I appreciate the opportunity given me to reply to Mr. Lawton's comments about my article in the January HPAC. My article presented some of the things that we have experienced and which would appear to warrant further consideration. In fact, the Committee on Steel Pipe Research plans to arrange for further research on the subject.

In regard to threaded and coupled joints, if the attack is from the interior and if the ends and interior wall are properly covered and tight joints are made, the joints may not become too involved. If attack is from the outside, proper coating of exposed threads or some of the tape wraps might be helpful.

In regard to pickling and a phosphate dip, it is well known that cleaning is very often accomplished by pickling. This is standard for hot dip galvanizing. In the case of organic coatings, a phosphate coating seems to promote better adhesion. In some of our work, this has been definitely shown. It is agreed that sand blasting is a good method of surface preparation before coating, but as the committee is particularly interested in the buttweld sizes and sand blasting is not as easily accomplished for the smaller sizes, we have considered pickling.

For many applications, five to six mils of baked phenolics seems to be doing satisfactory work in the paper industry, for tank cars and certain applications in the food and pharmaceutical industries and in a few instances for boiler tubes. We are interested in the cold set type of phenolic coatings and know that one of the limitations of the vinyls appears to be temperature. We plan to continue these investigations, and we will be glad to consider catalytically cured coatings as a part of the future investigations.

As life of piping depends on the environments in which it is used, the conditions under which pipe serves must be adapted to its normal resistance or protection applied in the form of coatings, cathodic protection, inhibitors, or other means.—GEORGE D. LAIN, Research Engineer, Committee on Steel Pipe Research, American Iron and Steel Institute.

LEWIS SMITH —

"Controls for Schools Can Be Simpler"

I WOULD LIKE to comment on the four articles, *How to Control Unit Ventilators in School Buildings*, by Harold W. Alyea, which appeared in the October 1953 HPAC and the three following issues. My comments are partly general and partly specific in that they relate to steam only. My first general comment is that controls are very easily overdone, to the extent that the end may not justify the means. There are a few relatively simple steps in a control circuit which will produce extensive results, beyond which each additional step is increasingly expensive and the result may be decreasingly valuable. Perhaps that statement applies with special force to school buildings.

The first of "a few relatively simple steps" is one which many control people seem to overlook. The need for heat is variable from day to day, and from hour to hour. Why not, then, make the heating medium itself variable to start with? Why not use a flexible medium? Why use a rigid medium — steam at 215 to 218 F — and install a lot of gadgets to overcome this rigidity, when the steam can be varied from 218 F down to 133 F without difficulty? By that means alone, 60 percent of the required result is produced without doing anything else. Of course, one answer to that question is the use of hot water, but there are reasons for avoiding the use of water for heating school buildings, except for panel systems.

By installing a control valve, steam can be throttled and made to flow through the system at any desired pressure or vacuum, provided there is a vacuum pump properly controlled to maintain circulation. School buildings usually have a vacuum pump anyway and the only elements missing for controlling the steam temperature in this manner are the control valve — or valves in the case of zones — and the pump controller. Since the piping, radiation, unit ventilators, vacuum pumps and boilers are unchanged, the extra cost for these items is obviously very small. Circulation of steam is insured not only in cold weather but in mild weather, continuously and not intermittently, at any temperature from 218 to 133 F.

Two striking results are obtained with this arrangement:

a) One of them is a constant difference in pressure across the pneumatic steam valve on the heating element of the unit ventilator. Lack of such a constant difference is, according to Mr. Alyea, one of the major problems and causes of "hunting" of the controls with erratic discharge and room temperatures. To try to cure this, he speaks of using submaster thermostats which seems like piling control on control which could be eliminated by approaching the problem from the direction that I have indicated. He suggests the use of a pressure reducing valve but such a valve will not produce a constant differential by itself.

b) The other result is that the pneumatic control is relieved of 60 percent of its duty by varying the steam temperature so widely. This not only benefits the operation of that control and prolongs its life but can make it simpler through the omission of the steam valve and "leakstat" on the unit ventilator. All of this is true, provided that the system is properly zoned for exposure, is properly orificed and that the radiation is calculated in a way that will be explained later. This leaves only the unit ventilator damper to be controlled from a room thermostat and the reduction in first cost may more than offset the cost of the control equipment that I have outlined.

In his closing paragraph, Mr. Alyea says "zone control of the steam supply to a building using unit ventilators ordinarily is not desirable and might be objectionable. Many of the zone control systems are intermittent in operation." Also, he says "Most of the continuous flow zone control systems resort to intermittent operation at mild temperatures and during this time produce the same results as the intermittent systems." I am glad that he uses the words "ordinarily" and "many" and "most." We all know that some control systems are intermittent and cannot be used with unit ventilators but there are also control systems which never give intermittent flow no matter what the weather. There is an unfortunate inference from his words that no zone control system will be satisfactory. In fact, he goes on further to say "it would be far better to omit zone control and provide a good reducing valve for the steam supply system." This seems to me to be an incorrect statement, and I cannot agree with it.

Previously, I said that the pneumatic steam valve on the unit ventilator could be omitted if the system is zoned for exposure, if it is orificed and the radiation calculated in a certain manner. Zoning for exposure is obvious and easily handled on any job. No explanation is needed here. It takes care of solar heat and wind velocity or direction. Orificing of radiation is also a common matter to insure good distribution of the steam. It has a special application to unit ventilators. These units are built with some kind of a distributing inner tube. The use of an orifice plate at the unit steam valve, or an adjustable orifice valve, results in throttling of the steam in mild weather, with partial filling of the element and by this means extending the control beyond the limits of the vacuum in the system. This promotes cooling in mild weather which can be carried out to the extent that there will be no steam in the unit when the maximum cooling effect is wanted.

Body heat gain is a different matter and is tied directly to the need for ventilation. Suppose that after calculating the heat loss from a classroom and the heat required for the minimum outdoor air, the body heat were deducted before figuring the radiation to be installed? If the room is designed for 30 pupils, then at 300 Btu per hr per pupil, we have 37.5 sq ft of radiation. When there are 30 pupils in the room, 37.5 sq ft is automatically provided and need not be included in the installed radiation. If there are only 15 pupils in the room, then only 19 sq ft is provided. With the damper controlled by a room thermostat, less outdoor air will be taken in, and less is needed. If the room is empty, perhaps little or no outdoor air is introduced, but none is needed. After all, outdoor air is required only to control odors, and if there are no pupils no odors are created. Therefore, this excess capacity should and can be removed from the installed radiation. In some cases, this may mean the selection of a smaller heating element for the unit ventilator. If auxiliary radiation is used, it can be reduced. If neither reduction is sufficient, then the orifice plate for the unit ventilator can be deliberately sized to reduce the maximum capacity. Thus, occupancy heat can be compensated for by damper control without a steam valve and without a "leakstat." If this adjustment is not made, then the room is overheated and the control becomes more difficult to accomplish.

Another factor to consider is the base temperature used for calculating radiation. Here in New York, zero is used. The record low is 14 below zero, but year after year zero is rarely touched and sometimes not at all. Of course, it is possible to have the equivalent of zero at an outdoor temperature of 15 F with a 30 mph wind, but that too is rare. Actually, the design temperature could be raised and more reliance placed on the surplus capacity of the unit ventilators with dampers closed to outdoor air and in an emergency raising the steam pressure, which will considerably increase the heating capacity. If in addition, a minimum night temperature control is used, set at 50 F, a substantial reduction can be made in the size and cost of the heating plant, as well as in the cost of operation.

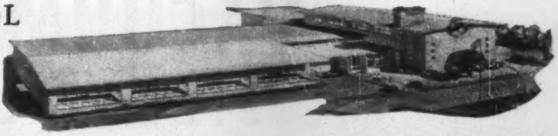
If the steam temperature is varied as described, it must be remembered that this controls the heat output not only in classrooms but all other radiation which is usually left uncontrolled. In addition, all the steam piping is controlled, and this can be quite a factor, sufficient alone to cause overheating in mild weather if uncontrolled. These two sources may often account for more than 25 percent of the total surface giving off heat. Therefore, by zone control with variable vacuum, the effectiveness of the heat control is 100 percent rather than the usual 75 percent or so.

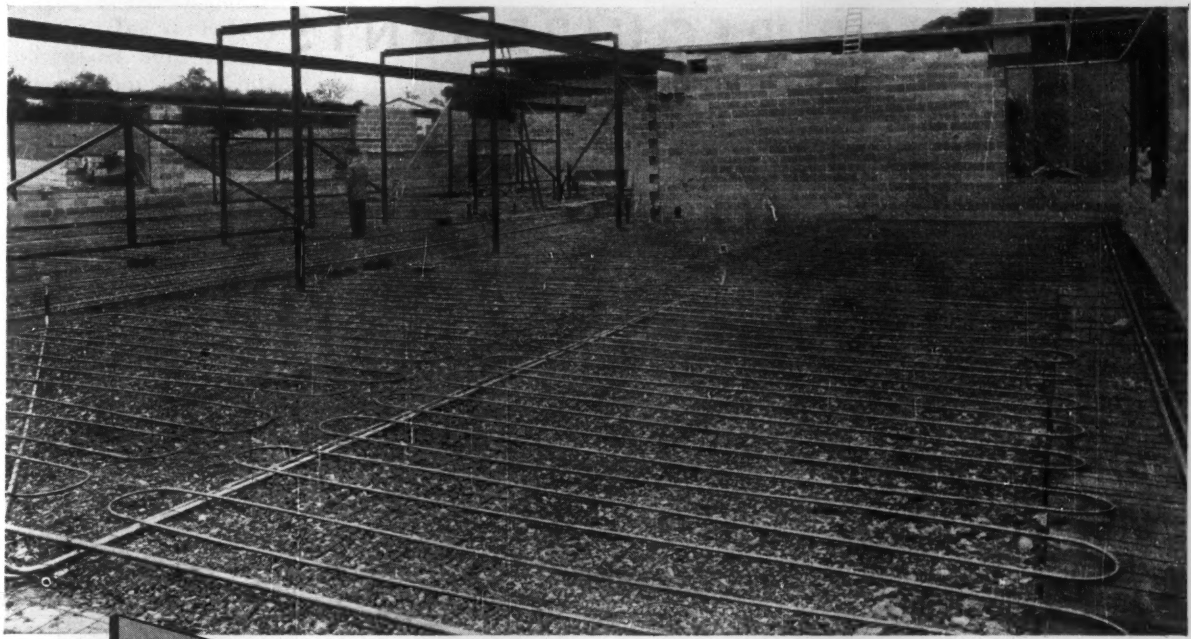
Temperature control systems in school buildings have gotten to be very complicated and expensive. My thought is that by the means that I have suggested they can be made much simpler and less expensive with satisfactory results — perhaps much more satisfactory in the long run. — Lewis Smith, Heating Engineer, C. A. Dunham Co.

MANCHESTER ELEMENTARY SCHOOL

Manchester, Missouri

Architect: CHARLES W. LORENZ, Kirkwood, Mo.
Contractor: JUENGEL CONST. CO., St. Louis, Mo.
Radiant Heating: BAGLEY & COMPANY, Inc., Robertson, Mo.
Revere Distributor: GRINNELL COMPANY, Inc., St. Louis, Mo.





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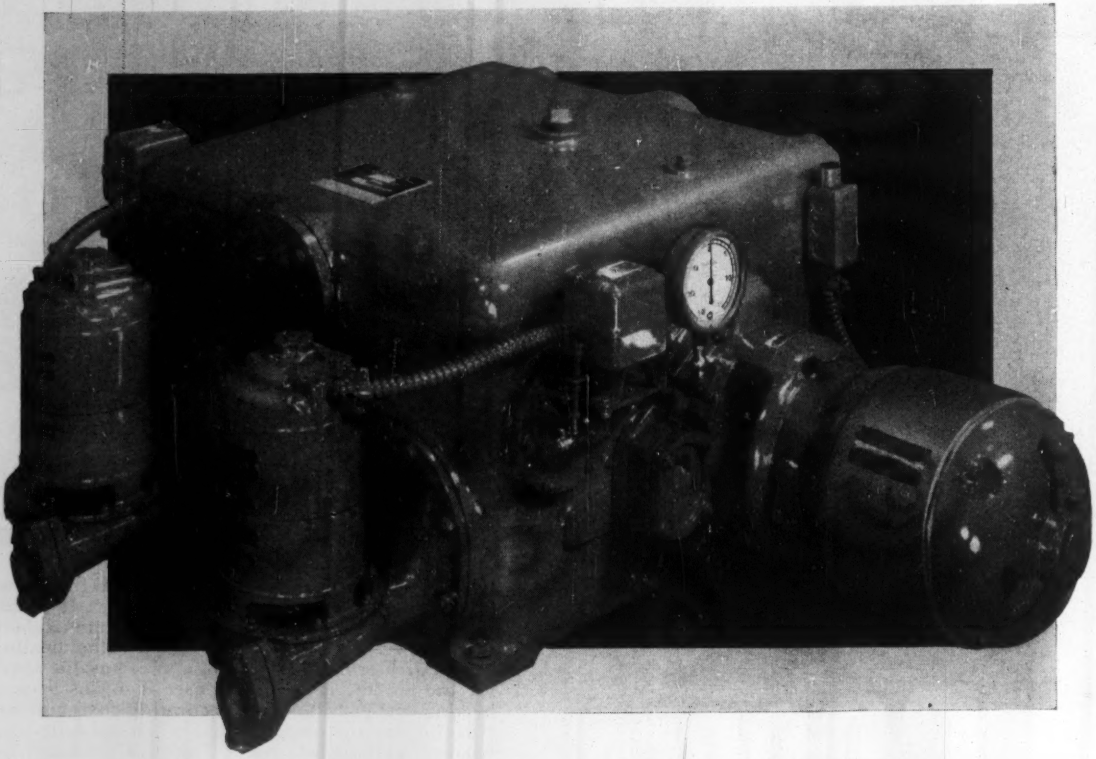

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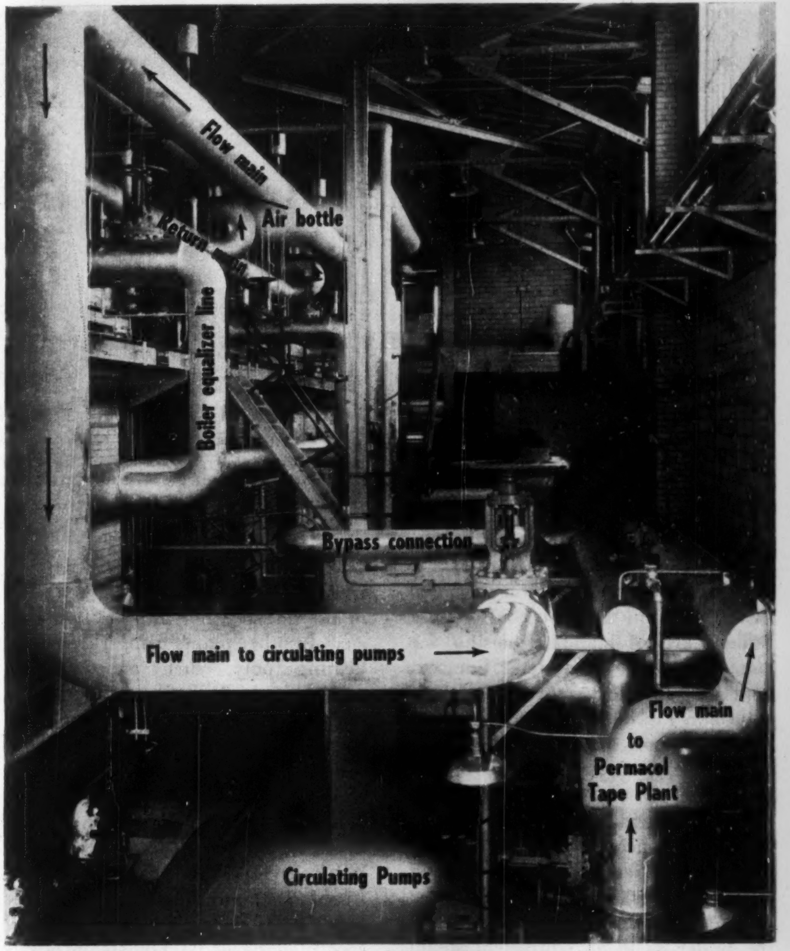


1 THREE BOILERS of standard design with a normal water line are used in this HTHW system, except for some minor changes. Here, the fronts of the boilers are shown with the piping identified

HTHW System Serves

. . . Personal Products plant 13 years, even though high temperature hot water is a rather "new" subject. Operating experience is cited

By Lewis Smith
Heating Engineer, and
Steven Senko
Engineer, Personal Products Co.

• The operating experience with this high temperature hot water heating system that has served the Personal Products plant for both process use and heating for over 13 years is discussed here along with a description of the plant and its component parts. The operating conditions are described as well as the provisions for maintenance.

DESIGNED in the late 1930's and first put into operation in 1941, the high temperature hot water system of the Personal Products Co. of Milltown, near New Brunswick, N. J. is one of the older installations of that type in the U. S. Having been designed from the bottom up for this particular service and with 13 years of operating experience to cite, it is worthwhile to examine this installation and bring out some of the features which may be of use to others who are interested in this type of system.

Piping for Distribution

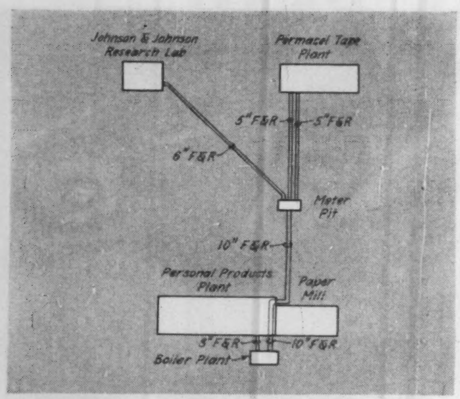
The distribution system as it exists today is shown in Fig. 2. The boiler room floor is the low point and it is about 5100 ft to the end of the longest main. The high point is the overhead piping in the roof of the Permacel Tape plant, 79 ft above the boiler room floor. The boilers are of the steaming type and since the normal water line is about 22 ft above the floor, the static head on the system at that level is about 57 ft.

The mains run in a tunnel part way, then in conduit. Loop expansion joints are provided in pits. The mains slope up steadily from the boiler room to the high point, hence require no air venting along the way.

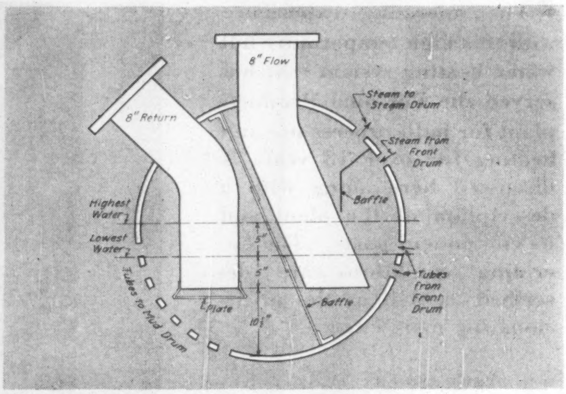
Personal Products and Permacel Tape are wholly owned subsidiaries of Johnson & Johnson, manufacturers of surgical dressings. In order to apportion the plant cost properly, water to these two plants, as well as to the research laboratory, is metered, and the flow and return temperatures are recorded continuously.

Water Flow Precautions Taken

Only one boiler was installed in the original installation in 1941. This is a three drum water tube boiler de-



2 THE PIPING DISTRIBUTION system remains the same as it was installed 13 years ago. The longest main from the boilers is about 5100 ft



3 THE NOZZLES are in the center of the top rear drum installed lengthwise, and the purpose of the plate over the end of the return nozzle is to distribute the water uniformly to the tubes

signed for a working pressure of 200 psig. A second boiler was installed in 1945 and the third in 1950. These boilers are of standard design for steam with a normal water line, except for the top rear drum. This is shown in Fig. 3. The nozzles are in the center of the drum installed lengthwise, and the purpose of the plate over the end of the return nozzle is to distribute the water so that it will not concentrate in a few tubes. It must be remembered that in a HTHW system about 10 times the amount of water is handled through the boiler as in an equivalent steam system. This amount of water at possibly 100 F or more below the boiler water temperature could, if concentrated in a few tubes, cause sweating and promote corrosion. As a further means to insure proper water flow through the boiler, a solid partition runs lengthwise of the drum but it stops about 2 ft from each end of the drum, thus separating the flow and return water. The partition is removable to permit boiler inspectors to get inside the drum.

Water Flow Precautions Taken

Since the flow header lies several feet above the boiler water line, it might be expected that this reduction in static pressure would cause steaming of the water. This does not occur under normal load conditions because of the high velocity of the water. However, after the third unit was installed in the plant, the boilers were only partially loaded and at times steaming did take place. To prevent this, a connection was made — now discontinued — to inject some of the return water into the flow nozzle. In other plants using HTHW for heating only, such a connection would no doubt be required to care for very low velocity at times of light load. The process load at Personal Products, however, is large and steady which prevents steaming.

Only one other change has been made in the boilers due to their primary service as hot water rather than steam generators. Some steam is used for heating the fuel oil, for soot blowing, etc. The steam nozzle is in a small header at the front of the boiler with one row of tubes back to the rear drum, designed to give dry superheated steam. However, the amount of steam used was so small that these tubes showed signs of overheating—so baffles were installed to protect them.

The boilers are oil fired, rated at 650 hp, and are designed to operate at 200 psig and at 200 percent of rating. The maximum required output occurs when the maximum heating demand on the coldest day is superimposed on the process load. This demand may run as high as 67,000,000 Btu per hr. In summer, the demand drops to 40,000,000 Btu per hr. Normally, the boilers operate at 185 psig pressure as measured in the steam space.

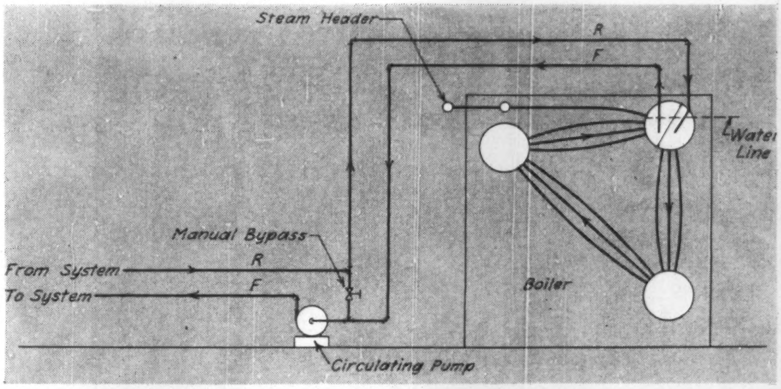
HTHW Piping, Pumps

A simplified diagram of the water circuit is shown in Fig. 4. The circulating pumps are in the flow main and each pump has a manual bypass which can be used to temper the water entering the pumps. Normally, these bypasses are closed, but at times of low demand the water can be cooled down as desired.

Leaving the boiler room are a pair of 8 in. and a pair of 10 in. mains — "a pair" meaning flow and return. The 10 in. mains are supplied by three 600 gpm circulating pumps driven by 40 hp motors designed for a working pressure of 300 psig at a pumping head of 150 ft. The 8 in. mains have four pumps rated at 400 gpm with 30 hp motors to operate against a head of 120 ft. These pumps have multiple ring packing glands in water cooled housings which seldom require repacking. The pump bearings are also water cooled.

In the meter pit — see Fig. 2 — the 10 in. mains terminate in headers. From that point, a pair of 6 in. mains runs to the research laboratory, and two pairs of 5 in. mains to the Permacel plant. The reason for two pairs in this case is simply that the plant outgrew the original single pair.

Experience with valves for 200 psig, 400 F water is interesting. Normally, gate valves might be selected but these did not prove to be as satisfactory as globe valves with tapered valves and seats. Therefore, that type is now used throughout the installation in spite of the somewhat higher pressure loss. There is quite a change in the viscosity of water from the usual 180 F to 400 F which may have something to do with this condition. All valves, regardless of size, are now cast steel body for 300



4 **THE WATER CIRCUIT for this HTHW system is shown here diagramatically. There are seven rows of tubes from the rear drum to the mud drum, 11 rows from the mud drum to the front drum and four rows from it to the rear drum. The circulating pumps are in the flow main and each pump has a manual bypass**

psig pressure with nickel alloy or stainless steel valves and seats.

Space Heating with HTHW

On an annual basis the demand from process work is much greater than for heating, although on severe winter days the heating may equal the process load. Some of the process work is accomplished by direct use of HTHW, and in other cases steam is used up to 40 psig pressure supplied through convertors.

In the Personal Products plant, space heating is accomplished by two centrally located fans with a capacity of 50,000 cfm discharging air in both directions into ducts extending the length of the building. The HTHW is used direct in the heating coils at full pressure and temperature. Each of the two fan units has a preheater set to come on at 40 F outside, which has a provision for admitting 100 percent outdoor air. One experience with the failure of one of the control valves to open, resulting in a freeze up and split piping, led to the installation of ¼ in. bypasses which are left open all winter. Each of the four duct systems has a reheat coil controlled by room thermostats. The controls are of the pneumatic modulating type. Three-way valves are not used to maintain continuous water flow. Instead, the boiler plant operators watch the flow and cut out pumps in mild weather. The coils of these heating and ventilating units are designed for an entering water temperature of 380 F and a temperature drop of 160 F.

The office area is heated with radiant baseboard installed on the basis of using water at an entering temperature of 225 F and with a 40 F temperature drop. This water is supplied from a convertor.

The research laboratory has a complete air conditioning system using HTHW for the heating cycle.

Heating of the Permacel Tape plant is accomplished mainly by unit heaters in the roof structure, taking 100 percent outdoor air but using face and bypass dampers controlled by room thermostats for temperature control. There is constant water flow through the coils which are likewise designed for an entering water temperature of 380 F and a 160 F temperature drop.

Operating Conditions

Under normal working conditions, the boiler pressure is maintained at 185 psig with the safety valves set for 200 psig. This means a steam temperature of 382 F, with the water being drawn off just below the water line. Therefore, the water temperature is almost the same. This is the temperature of the water leaving the boiler house, unless it is reduced by cracking open the bypasses at the pumps.

The return temperature of the water in the 10 in. main runs about 292 F and in the 8 in. main 328 F. The higher return temperature in the 8 in. main is due to the larger proportion of process work in that building, mostly paper machines. Then, too, the 8 in. mains are much shorter. The return temperatures are of course lower in cold weather when the high temperature drop in the heating and ventilating units chills the water more.

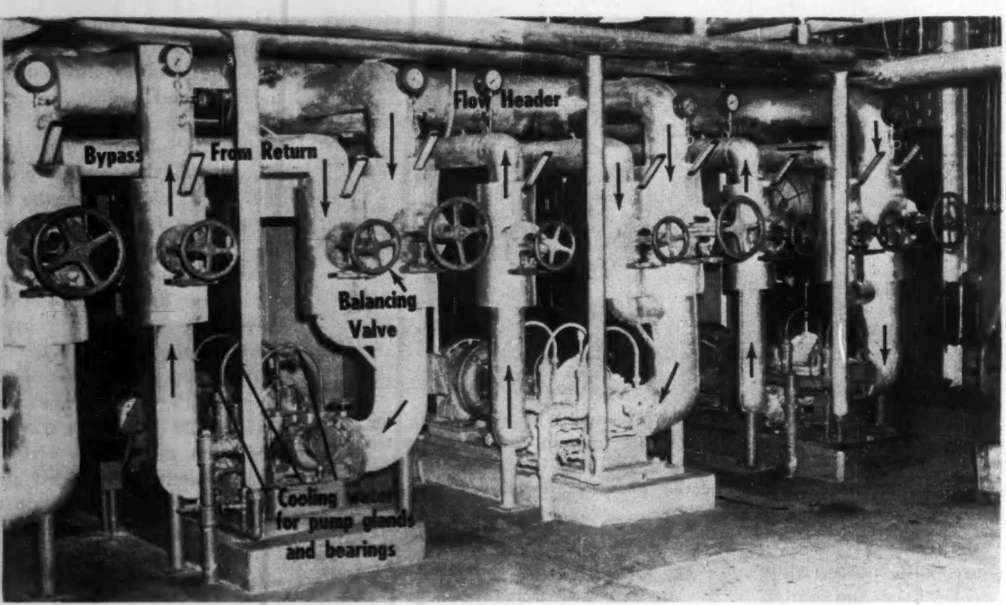
The circulating pump gages show about 195 psig pressure at the inlets, at which pressure the flash point is enough higher to prevent steaming in the pumps. The increase of pressure above the boiler pressure is of course due to the static head between the boiler water line and the level of the pump inlets. The pressure at the high point of the system in the Permacel Tape building is about 220 psig, which is due to the fact that the pumps on this 10 in. main discharge at 250 psig. The pumps on the 8 in. main discharge at 235 psig.

Provision for Maintenance

With the high point of the system about 57 ft above the boiler water line, it is obviously necessary to keep enough pressure on the boilers at all times to retain the water in the piping. The plants run 24 hr a day, 7 days a week, so that except for a few holidays and necessary shutdowns for repairs, the boiler pressure is maintained constantly. When a shutdown does take place, the boilers are valved off to retain the water in the system. In some other plants supplying heat only — with frequent or even daily shutdowns — separate pneumatic expansion tanks would be required, and it would probably be necessary to have auxiliary surge tanks to accommodate the expansion of the water without wasting it.

There is always a slight and unavoidable loss of water through pump and valve glands, soot blowers, etc. The condensate from the fuel oil heaters is likewise wasted. Then, too, in this plant there is a weekly blowdown of the boilers — about 1 in. in the gage glass. Thus, there is a certain amount of make-up water required, about 150 to 180 gal per day. Small feedwater pumps operated from water level control are used, drawing from storage tanks where the raw water is deaerated and treated. An analysis of the boiler water is made daily. The frequency of operation of the feed pumps is observed to detect excess running which would indicate a leak.

Electric power is purchased. To guard against failure of lights, emer-



5 THE CIRCULATING PUMPS have multiple ring packing glands in water cooled housings which seldom require repacking. The pump bearings are also water cooled. Balancing valves are provided that permit the water entering the pumps to be tempered

gency lighting circuits have been installed and wired to two 7½ kw turbo-generator sets in the boiler room. Each turbine has a pneumatic steam valve that is held closed by air pressure. Each air line goes to a solenoid valve arranged so that in case of failure of electric power, the air pressure is released and steam is fed to the turbines. Emergency lighting is on within 7 sec after a power failure. In the event of a long failure, there is a steam driven oil pump which can be started and will automatically maintain the proper pressure for the burners. Also, there is an emergency steam driven feed pump. There are no steam driven circulating pumps, but no process work can be carried on during a power failure, and the residual heat in the water in the systems is enough to avoid any danger of a freeze up.

No automatic air venting is used. No vents are needed on the underground mains because there are no high points. At high points in the boiler room and within the buildings "bottles" are used. These are pieces of 3 in. pipe about 6 in. long welded into the top of the pipe, capped and with a ¼ in. line to a hand valve at a convenient point. These bottles are occasionally blown off, but actually after the original venting there is little accumulation of air.

It is often said that with a HTHW system there is grave danger of violent explosion due to the release of superheated water. This is not so, in our opinion. As a matter of fact, there is less danger of explosion and to workers with this type of system than with other types operating at the same pressure, it is believed.

A split pipe or fitting can only release the amount of water which can get through the break. The water tries to flash into steam, but that requires heat which is taken from the water itself with the result that practically no steam is formed and the water is cooled so much that the hand held 18 in. in front of a wide open ¼ in. valve is not uncomfortably hot. Of course, the water from a large break can cause property damage, and it would rapidly lower the boiler water line.

What About Costs?

The comparison of the cost of installation of a HTHW plant with other plants is difficult to make because the designs are so different. Often, there may not be much difference in cost, but it is frequently in favor of HTHW. There are no traps with the HTHW system, and pipe sizes are generally smaller. Grading presents less difficulty, often resulting in less expensive trenches where an underground installation is involved, which permits the use of fewer pumps. The reason for the selection of HTHW is often based on better overall efficiency of operation and lower maintenance cost rather than lower installed cost.

Since the HTHW system uses no traps, there is no loss from flashing of high temperature condensate. Because of the heat stored in the water in the system, the load on the boilers is relatively steady, which tends to maintain a relatively high combustion efficiency. Scaling and corrosion offer few problems, and as a result there is little need for blowing down the boilers or for tube cleaning. At Personal Products there has been no scale in 13 years of operation. Also, small amounts of makeup water is used. Records kept by Johnson & Johnson indicate that when overall costs are considered, including distribution and utilization, the HTHW system at Personal Products operates at a cost of about 13 percent lower than other plants operated by Johnson & Johnson.

This plant was designed and installed by the J. O. Ross Engineering Co.

THE NEW ELECTRONICS supply office building at the Great Lakes, Ill., naval station presented a number of problems which were solved by installing a high velocity system

Large High Velocity System Ventilates New Office Building

By James H. Stiggleman
Assistant Chief Mechanical Engineer
Childs and Smith, Architects and Engineers

• Five main supply fan systems furnish over 175,000 cfm of air for ventilating this new naval office building. The high velocity system, described here, is believed to be one of the largest of its type ever installed. All duct joints were welded to prevent leakage and low sound levels are obtained through the use of sound boxes between the end of the duct and the diffuser.

In designing the ventilation system for the new electronics naval supply office building at Great Lakes, Ill., many problems were presented. Ceiling heights were kept very low in order to keep the building volume and cost as low as possible and to give the building a low silhouette so as to conform with modern design.

Preliminary design of the ventilating system, using a conventional approach, led to nothing but frustration. Ventilating units installed under the windows were not practical since there was so much interior area. At the time this building was being planned, there were some high velocity systems installed, but they were new and most of them were of the under the window type. Besides, it was estimated that in order to fit ducts into some of the spaces provided, velocities would exceed 5000 fpm. To my knowledge, no system using velocities as high as this in an office building had been used.

High Velocity Considered

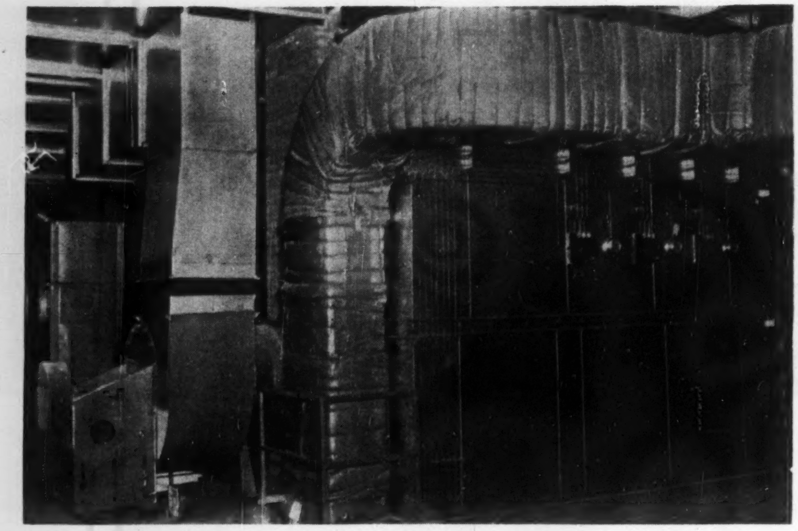
The next step was to investigate the possibility and practicability of a high velocity system of this type. The main obstacle was noise. This could be broken down into three major parts of the system: the fans, the duct construction and the ceiling diffusers. Several fan and ceiling diffuser manufacturers were consulted about the problems involved, and considerable encouragement was offered indicating that the noise problem could be overcome.

Preliminary estimates of the static pressures in operating systems of this type revealed that they might be as high as 9 in. This was no major problem as far as the fan manufacturers were concerned, but the noise factor heretofore had rarely been so important. Class three fans (now known as heavy duty, class two) had to be selected, and it was determined that the quietest operation would be obtained, not based on tip speed, but by selecting the fan with the highest static efficiency for the cfm and static pressure involved.

Round Ducts Used

Due to the high static pressures and velocities that would be encountered, it was decided that round ducts should be used wherever possible. The contractor was given the choice of using either 24 gage prefabricated spiral seam ductwork, or he could fabricate round ducts of galvanized steel with soldered longitudinal lock seams using 24 gage up to 8 in. diameter, 22 gage from 9 to 26 in., and 20 gage from 27 in. and higher. The metal for the fittings was specified as two gages heavier than that for the ducts. Joints between duct sections and between ducts and fittings were lapped with a good slide fit and then welded. After assembly, the joints were covered with two layers of tape.

There might be some question concerning the reason for welding the duct sections together. High velocity systems have been installed with sections taped only, and they are working satisfactorily. However, they have not been in operation for very many years, and it was felt that in time the mastic on the tape might dry out, causing leaks. After more years of operation for systems taped only, this lack of confidence may prove unwarranted. It was believed in the case of this building that the expense involved in removing the ceiling and chasing leaks some years hence would be far more than the added expense of welding duct sections during construction. Where it was necessary, because of space limitations, to use rectangular ductwork, gages were increased and stiffeners were installed fairly close together. All rectangular ductwork was insulated on the inside.



WHERE RECTANGULAR ductwork was used, gages were increased and stiffners were installed fairly close together.

Sound Box Reduces Noise

Some of the manufacturers had introduced new high velocity diffusers about this time. Much enthusiasm was shown about these new products, but there were not very many installations. These outlets essentially consisted of a sound box lined with insulation and equipped with a pressure reducing valve in the inlet that could control the air volume, permitting the air velocity and pressure to be reduced. Some of the boxes were also provided with insulated baffles to further reduce the noise level. Attached to the box was a conventional ceiling diffuser. A piece of flexible duct was used to connect the box inlet and the duct.

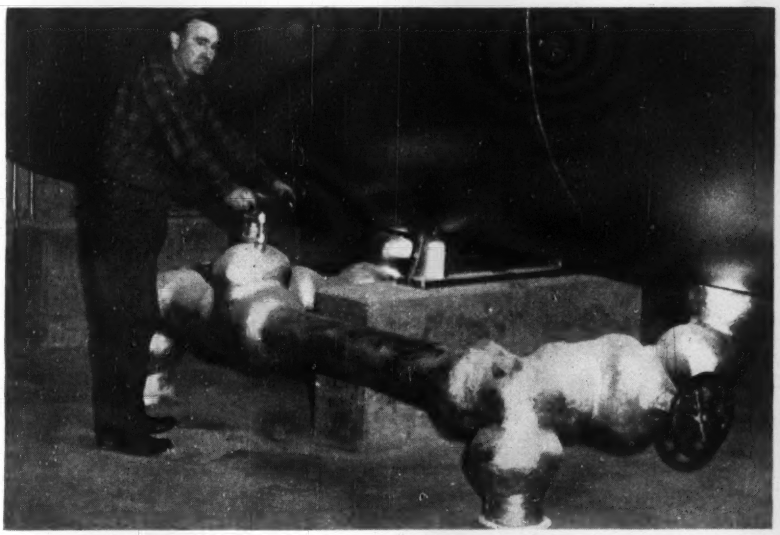
Test models of this air distribution arrangement were made in the laboratories of some of the ceiling diffuser manufacturers using the same ceiling height, cfm, static pressure and outlet temperatures as called for in our design. The results obtained from these studies were excellent. Since these tests were so encouraging, rooms in the building were classified according to usage and assigned permissible decibel ratings based on a sound level in a room with 100 Sabins. These allowable decibels ranged from 38 in the case of private offices up to 52. Each decibel value was assigned a code designation letter, and all the rooms in the building were matched with the code letter corresponding to that room. This special care was taken so that there would be no doubt in the mind of the ventilating contractor and the ceiling diffuser manufacturer as to the desired results. All of the diffusers were tested before shipment to be sure that these results were attained.

The distribution of ceiling diffusers and their respective operating ranges in order to adhere to the sound levels established are as follows: 129 diffusers at 100 to 200 cfm, 140 diffusers at 200 to 300 cfm, 83 diffusers at 300 to 400 cfm, 170 diffusers at 400 to 500 cfm, 19 diffusers at 500 cfm and two diffusers at 600 cfm.

Each diffuser is 24 by 24 in. square to fit in to the ceiling pattern. The ductwork was designed on the basis of an average of approximately 1.9 in. static pressure per 100 ft. All of the fans were selected to provide 1.5 in. static pressure at the last outlet. All diffusers in the building, with the exception of the dining room, are laid out in a checkerboard pattern using two diffusers per bay. The size of each bay is 31 ft by 20 ft.

Air Conditioning Provided For

At present, only a portion of the first floor is air conditioned; however, all of the ducts are sized for complete air conditioning of the en-



VENTILATING AND AIR CONDITIONING controls and equipment are in the penthouse. Here, an engineer opens a valve which serves the auditorium and cafeteria.

tire building that may be installed in the future. Also, provision has been made for the future installation of the air conditioning equipment in all of the supply fan systems. The system was designed on the basis of a 30 F diffusion temperature, which resulted in an appreciable reduction in the duct sizes and the resulting cost of installation.

Branch ducts are provided with pressure reducing valves of the same type that are installed in the ceiling diffusers. These were used instead of the conventional splitter dampers. The system was completely balanced on the basis of static pressure rather than by cfm determinations. The air diffuser manufacturer worked very closely with the ventilating contractor, The Robert Irsay Co., in balancing the system. Our working drawings were marked up by the diffuser manufacturer's engineering department with the static pressures necessary at each branch duct and outlet. Using these marked up plans, two engineers took static pressure readings at the branches and outlets, and adjusted the pressure reducing valves to obtain the static pressures marked on the plans. After this was done, no appreciable further adjustment was necessary to completely balance the systems. All of the systems were completely balanced by two men in four days.

The exhaust and recirculating air systems in the building are of conventional design. This was possible by installing this ductwork in the lower ceiling corridors and utilizing sidewall return air grilles.

The electronic supply office building has five main supply fan systems furnishing over 175,000 cfm of air. The fan static pressures range from 6¾ in. to 8½ in. As such, it is believed to be one of the largest high velocity systems of its type ever installed.

Three Miles of Plastic Pipe Serves Oil Field Installation

. . . for over a year

More than three miles of rigid vinyl plastic pipe, probably the largest single installation of its type, has been operating successfully in the Kansas oil fields since December, 1953, according to the B. F. Goodrich Chemical Co. The pipe carries salt water separated from crude oil to deep disposal wells.

Under Kansas law, all salt water obtained from oil production must be returned deep enough into the ground to prevent any contamination of the earth's strata containing water which might be used for consumption or irrigation. With the aid of heat and various chemicals, an emulsion treater separates the gas, oil and salt water, the latter being channeled into the rigid vinyl plastic pipe.

Engineers chose the rigid vinyl pipe because it does not corrode. The pipe is laid rapidly by joining sections together with a special cement. One end of the pipe is belled during manufacture so that each length fits snugly into the other, held in place by cement which forms a bond practically as strong as a section of the pipe itself.

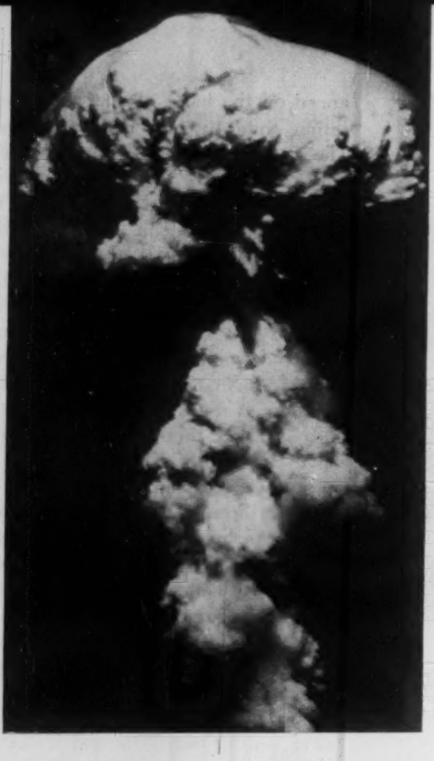
The pipe was laid in extremely cold weather, at temperatures around 11 F, and yet the cement dried rapidly enough so that installation continued as rapidly as the construction crew could work. Simplicity of installing the light weight plastic pipe "reduced installation costs up to one-third as compared with the cost of installing other types of pipe". In one installation, three men laid 4000 ft of 4 in. plastic pipe in one day.

Approximately 12,300 ft of 3 in. and 4000 ft of 4 in. pipe in 30 ft lengths are included in the installation. Costs for digging the ditch, installing the pipe and back filling were about 20c per ft.

Optimum Temperature in Offices Mid-70's

. . . for peak efficiency

For office personnel performing mental work, the American Institute of Management reports that the temperatures found to be most conducive to peak efficiency are in the mid-70 F range. At 85 F, employes were only 80 percent efficient. At 95 F, efficiency dropped to 50 percent. For hot, humid summer months, the average drop in mental efficiency has been found to be about 40 percent. With air conditioning, mental efficiency held steady, absenteeism dropped off and turnover decreased.



New Laboratory

. . . to development of heat exchange applications for atomic energy, heating, air conditioning

THE NEW research and testing laboratory of The Trane Co., at La Crosse, Wis., dedicated recently, may duplicate the withering heat of an African gold mine or biting Alaskan cold, in order to pretest equipment designed for use at almost any place on earth.

Heat Exchange Studied

This laboratory is one of the few in the U. S. devoted exclusively to the science of heat exchange and the problems that are involved. These problems range from heating a building of any size, to cooling a guided missile in flight, from air conditioning a factory or skyscraper to helping harness atomic power for peace. Heat exchange, of course, figures in a host of industrial processes including foods, drugs, chemicals and petroleum. In some industries, the trend is to higher and higher temperatures. In others, some processes may demand 300 or 350 below zero F.

Back in 1950, the testing laboratory then in use was beginning to burst its seams. At that time, the laboratory occupied a little more than 10,000 sq ft. It was evident that in order to look farther ahead, perhaps 10 years, that a new laboratory should be planned and built. The job of studying the requirements and submitting proposals fell naturally to the company's engineering staff and the development committee. This is the committee responsible for development of new products, improvement of present ones and preparing research programs, and is headed by R. E. Lucey, vice president in charge of engineering. The committee, laboratory staff and engineers from the company's sales divisions began studying the probable future laboratory needs — the scope a laboratory should have — projects that could be undertaken with expanded facilities — and the problems of physical structure and facilities.

The report of the first plans for this laboratory envisioned a building of about 26,000 sq ft, erected as the first unit of a complete new administration building group which would also include an engineering building. From the first meeting to discuss this plan, some felt the laboratory should be still larger. This feeling has been crystallized into construction of the present building with about 35,000 sq ft of floor space.

Plan for Next 10 Years

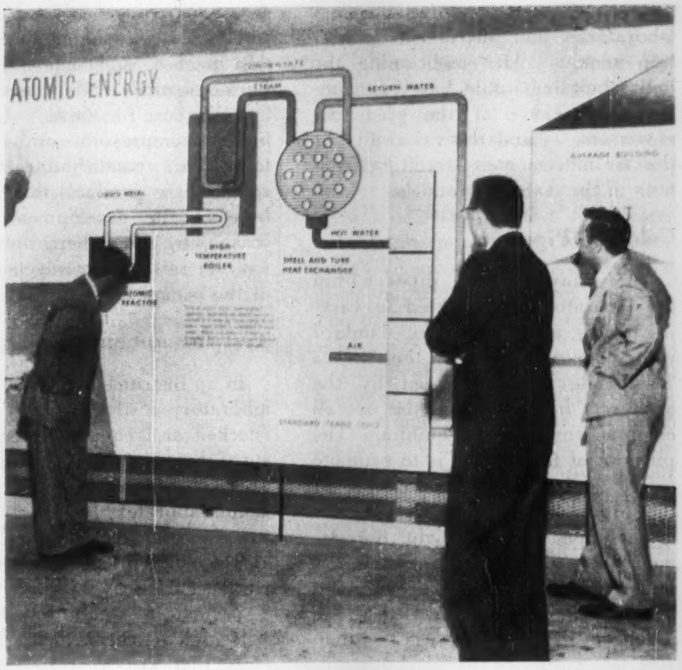
President Donald C. Minard informed the committee that he felt their laboratory plan should be comprehensive enough to protect the company for the next 10 years under all foreseeable circumstances.

Company engineers drew up the general requirements for the steam, water, electric and sewer services and preliminary drawings of major testing equipment for the architects. They also worked out scale models of laboratory apparatus to utilize in planning the layout.

"We found," Mr. Lucey recalls, "that planning a laboratory was a lot different from planning a new building for manufacturing. One of our biggest problems was to provide flexibility where we simply can't predict, years in advance, exactly what our research and testing requirements will be.

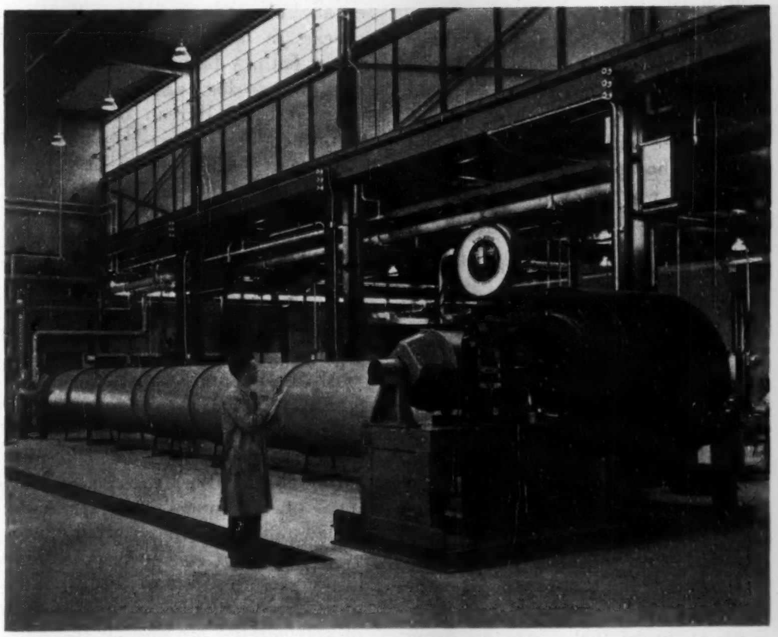
"We did agree we needed, among other things: a) One large bay two stories high — a craneway of 40 ft span and 120 ft long — to be a convertible test area in which all sizes of refrigeration units could be tested, with all other test sets located in the area to remain portable. b) One ceiling high enough to do practical research on projection unit heaters which are often mounted overhead in commercial and industrial buildings. This could also be carried on in the craneway area, and a catwalk would permit easy set-up of the test equipment. c) Space for a dozen

Dedicated



HOW ATOMIC ENERGY can heat a building is shown in this schematic display at the new laboratory. Liquid metal is heated in an atomic reactor, at the left. The hot liquid metal then goes to a boiler, in which steam is produced. The steam goes from the boiler to a shell and tube heat exchanger, where it heats water. The hot water from the exchanger then goes to a heating coil. Fans blow air over the coil and the warmed air then enters the building at the right

or more air tunnels for testing units ranging from small coils to massive equipment. d) Several special purpose rooms including a quiet room to be isolated from vibration, for testing sound levels of equipment and conducting research in that field, and one radiation test room which is a room within a room where air in the shell around the walls, ceiling and floor of the inner room could be refrigerated or heated to help test either heating or cooling equipment in the inner room. Also, two cold rooms, one able to create −25 F and the other −65 F."



LOOPS OF PIPING are installed around each bay with valved openings every 10 ft for water, steam, air and gas. This interior view of one part of the laboratory shows the piping and some of the test facilities.

Flexibility in Piping Planned

"One of the things we considered most important was to arrange the electric service and the piping for steam, water, air and gas so as to have perfect flexibility for the unpredictable test arrangements.

"We worked out a plan to run loops of piping around each bay, with valved openings every 10 ft for water, steam, air and gas. In this we were doing with piping what a modern builder does when he installs plenty of electrical outlets.

"We followed the same principle with our electrical system by installing loops of bus duct — just as we had installed loops of piping — so we can plug into the power at any point.

"For drainage of water from our test set-ups, we also planned a trench system that runs independently into each of the major sections of the laboratory," he said.

This flexibility within the laboratory also had to be maintained in the overall plan, so the structure is easily expansible.

One question may occur as to why the large testing areas were not air conditioned, as are the front office sections, chemical and metallurgical laboratories and instrument calibration room. Air conditioning the entire building would have been unfeasible because of the great air movement — and the variability of this air movement — resulting from tests in the many air tunnels.

Color of Pipes

The many different pipes within the laboratory are painted in varying colors according to a standard color code advocated by the ASME. This code was also used by the architects in arriving at the overall color scheme for the building. The purpose of the scheme is to promote safety and make identification of the pipes simpler. High pressure steam pipes are a bright orange; cold water a light green; hot water, lemon yellow; city gas, brown; and a very dark blue, compressed air — which, in the laboratory, is less than 100 psi.

It seemed advisable to consider the possibility of the subsoil freezing under the cold room since the temperatures will range from above freezing to about −60 F. Mr. Lucey recalls that an expert was consulted on this problem but that, in view of the rather light sandy soil of the laboratory site, the expert advised it would be unnecessary to provide under floor ventilation or heating.

One other condition also called for special treatment. In the air tunnel room, where large quantities of air are regularly exhausted by equipment being tested, it was decided to install a separate ventilating system for make-up air. In this connection, a cost saving wrinkle was worked out that is of interest.

Suppose large heating coils are being tested in this room. In winter it would be wasteful to exhaust the warm air from those heating coils to the outdoors. Instead, the system is so arranged that warm air from two or three of the largest air tunnels can be diverted back into the plenum chamber and used to help heat the rest of the laboratory.

Quiet Room Floats on Felt

In a room within a room that floats on felt and rubber, sound-sensitive instruments are used to measure noise in equipment. In this quiet room, isolated from extraneous noise, sound meters, vibration probes, and octave band and harmonic analyzers are used to probe and diagnose for noise. Unit ventilators, compressors and self contained air conditioning units are some of the products that are tested here in the development stage to make sure that their noise output will not raise the average sound level of the occupied area.

Test Instruments Calibrated

In an instrument calibration room, laboratory instruments are carefully checked at frequent intervals to insure their accuracy. Instruments are calibrated for accuracy with precision laboratory master standards of pressure and temperature. For example, a high precision water manometer, accurate to 0.001 in. of water — which is equal to 0.000036 psi —is used to check inclined manometers that are used in testing and rating fans.

Thermometers are held to an accuracy of 0.05 deg by calibration checks in a constant temperature water bath, a bath which is held to 0.01 of a deg, and it is double checked by a Bureau of Standards calibrated thermometer accurate to 0.01 deg. The instrument calibration room is thus a watchdog over the accuracy of laboratory tests that determine capacity ratings, which help engineers select products for efficient performance.

Room Within a Room

All four outer walls of a room within a room are surrounded by chilled air to test and rate convectors inside according to the convector rating code. Wall surface temperatures of the inner room are maintained at 55 F. They could be made even colder for special tests, or even heated for testing air conditioning units, by circulating warmed instead of refrigerated air around the outer walls. Permanent readings of many temperatures are made and recorded during each testing period.

Compressors on Life Test

Hermetic centrifugal compressors are tested and rated in a specially designed area with facilities for controlling condenser water temperature and cooling load. Compressors from 200 to 300 hp are currently being operated to obtain performance data for unusual conditions. An economizer for these sizes of compressors has been developed that is said to reduce power consumption 4.5 percent.

In another type of test, an eight cylinder reciprocating compressor has been kept operating for a total of 8001 hr.

Other Testing Equipment

Reciprocating refrigeration compressors and condensers are tested in an unusual calorimeter. As an electrically heated evaporator boils the refrigerant, the electrical energy consumed is measured by a photoelectric cell that counts the revolutions of a watt-hour meter. The flow and temperature drop of the refrigerant, condensing water and the electrical energy consumed by the compressor motor are also measured.

Steam coils are rated in an air tunnel test set-up which includes a grid of 60 thermocouples, spaced only 6 in. apart, on the leaving air side of the coil, and another bank of 30 thermocouples on the entering air side. The large number of thermocouples are required in order to get a truly representative average of the temperature across the coil. In a similiar test, each thermocouple is read individually to determine the uniformity of temperature distribution across the coil. In this rating test, the air and steam pressure drops are measured and condensate is weighed. Where required, a preconditioning coil is used ahead of the coil under test to give a higher or lower air temperature entering the test coil than the room temperature.

Temperatures ranging up to 2500 F can be created in an atmosphere-controlled furnace for research in new methods of fabricating heat exchangers designed especially to cope with the ever-climbing temperatures of new industrial processes and perhaps, too, to help in harnessing of atomic energy.

The laboratory is equipped with chemical and metallurgical facilities for analysis of metals, oils and refrigerants and for taking photomicrographs of metal specimens. An automatic salt spray bath is used to test the relative corrosion resistance of metals and metal coatings.

Two Atomic Displays

An atomic display showed, symbolically, how atomic energy can be used to heat buildings. This display incorporated an actual heat exchanger. Another display sketched the principles on which atomic power could propel an airplane, much as nuclear power will propel the submarine Nautilus. These illustrations were, of course, schematic to protect security information.

Peaceful Atom Practical Soon

Speaking at the dedication preview of the new laboratory devoted to heat exchange problems, including those essential to harnessing atomic power, Robert LeBaron, top military adviser on atomic energy to President Eisenhower, said such a program could make the atom practical for power generation and other peaceful uses within five years. Mr. LeBaron is assistant to the Secretary of Defense for atomic energy and chairman of the military liaison committee of the Atomic Energy Commission.

In what was obviously an administration trial balloon, Mr. LeBaron told a nation wide radio audience:

"I propose the immediate formation of a Manhattan Engineer District for peacetime power. This was the name of the all-out effort in World War II to build our first atomic bomb. If we would only recreate the Manhattan Engineer District philosophy and the unique devotion for the military atom in a campaign for the peaceful atom, we could move into this great new era in five years instead of 10."

Mr. LeBaron said he was not "advocating a crash program that will waste the taxpayers' money. I am emphasizing that there is much more that can be done. I believe this proposal represents a sound investment of our energies. I ask you to weigh these facts and then ask yourself if we can afford not to support such a program with all our resources.

"What could be more appropriate in this era of cold war than a cold war for peace?" he asked.

If the nation had followed "the ordinary pattern of technology" in building the original atomic bomb, he said, its creation "would easily have taken 25 years instead of three."

And if development of the peaceful atom is tackled in an ordinary way, on a step-by-step basis, "five years will be needed to build the first generation of reactors and — after that — another five years will be required for the second generation" which would incorporate knowledge gained in building and operating the first.

However, Mr. LeBaron contended, "there is no reason why we cannot overlap these two generations of reactors if we are agreed on the national importance of carrying out this job in a shorter period.

"These are not ordinary times and ordinary standards are worthless measuring sticks in this year of crisis. We need extraordinary methods and extraordinary yardsticks of time measurement now."

Immediate determined effort to develop peacetime atomic power, Mr. LeBaron held, "may save precious time in building new facilities when we need them most" and provide a ready reservoir of trained industrial brain power if America ever has to reshape its economy from peace to war.

Heat Transfer Common to All

In addition to industrial heat transfer applications and others contributing to "many of the indispensable functions of our everyday life," he said, there are "many facets of new industrial technology.

"Among these are atomic energy, jet aircraft, guided missiles, space travel, electronics, radar, low temperature and many others of a wide variety.

"In all of these, there is the common denominator of heat transfer — how to handle the heat of the atom — how to dissipate heat in high speed air flight — how to take the heat out of the interior of guided missiles — how to handle the heat problem in space travel — how to transfer heat generated in your own TV set."

From laboratories dealing with such problems and the industrial fabric in general, Mr. LeBaron said, must largely come the brain power needed for future defense in a world living with twin atoms — the military atom and the peaceful atom.

The same military atom that "can package millions of tons of energy in deliverable weapons," Mr. LeBaron pointed out, is worth — as a power fuel — "roughly 3,000,000 times its weight in coal or oil.

"It does not decay, rust or lose its usefulness with the passage of time," he said. "It is so compact that it can be quickly and easily changed from the peaceful power source to a military weapon."

And, he declared, "the 'if' in peacetime atomic power is no longer present. We are, in fact, over the first great hurdle in our atomic future. The peaceful atom is definitely here and now."

Then, proposing his Manhattan Engineer District project for peacetime atomic power, Mr. LeBaron asked: "What could be more inspiring than a new dedication by our scientists and industrialists to a specific project for peace? Is there not a great opportunity here to unify our efforts in atomic peace, as we did in atomic war?"

Mr. LeBaron answered critics of the H-bomb tests by saying that the atom is here and the world faces the problem of living with it. "No other course is open to us. We cannot turn back the clock of science. If we were to have stopped the recent H-bomb tests in the Pacific, nuclear science would have been poorer, and the time of arrival of the peaceful atom correspondingly delayed."

He called for Americans to "put the proper emphasis on the good in the atom, and not hide the potential for peaceful gain in the fear of the bomb."

Referring to proposals for widespread scattering of industry as one of the defenses against atomic attack, Mr. LeBaron took the view that the same atom which can be so destructive against a big city also makes it possible to decentralize by making power available virtually anywhere.

"The advent of commercial atomic power will be a great force for decentralization of industry," he said, so it "has within itself the direct antidote for the destructive forces of the military atom" against concentrated targets.

Thus, he said, "the power inside the atom carries its own protection of human life if the world will only use it for peace. Let us dedicate ourselves to the peaceful atom and win its place in the sun with the same energy that we used to build our military atomic supremacy."

THE NEW PRESIDENT of the national association, J. DeWitt Morrow, right, of Houston is shown here congratulating the newly elected vice president, Edward Jungbert, Coral Ridge, Ky.

HPAC Contractors Convene

. . . to report year's progress, plan for the future

THE GROWING market for air conditioning, piping and heating services in commercial buildings, industrial plants and other buildings of all types was the general theme of the 65th annual convention of the Heating, Piping and Air Conditioning Contractors National Association, which was held in Atlantic City at the Hotel Traymore. Better installation methods and procedures and ways for the heating, piping and air conditioning contractor to assure his getting his full share of business were stressed in committee reports, talks and panel discussions. Other subjects which were given importance on the program were apprentice training, selling — with emphasis on the benefits that are provided to the consumer — and cooperation with utilities in building business.

Close to 600 attended the convention, which had been planned by the New Jersey, New York City and Philadelphia local associations' convention committee under the chairmanship of James M. Anderson of Philadelphia. Membership of the HPACCNA totals more than 1250 mechanical contracting firms, from 40 local associations.

Joseph C. Fitts Honored

Robert W. Lawinger, who has been serving as president of the HPACCNA during the past year, was unable to attend the convention because of illness. Vice President J. DeWitt Morrow presided in the absence of Mr. Lawinger.

Joseph C. Fitts, retiring secretary of the national association, gave his annual report and emphasized the importance of the work that has been done on the development of the apprenticeship program for training pipefitters. He explained how invaluable this new and revived program was for the life of the industry in training young men to be competent and responsible workers in the trade.

Mr. Fitts said, "I wish to take the opportunity to thank the members of this national association for the many courtesies shown me throughout the years. As mentioned in many former reports, your secretary can do only what the members, the local groups and the national staff help him do. That cooperation of the members, of the local and state secretaries and of the national staff will always be a most pleasant memory."

At the close of Mr. Fitts' report, W. H. Oleson, executive vice president of the Milwaukee association, gave Mr. Fitts a gift from the local associations in appreciation for his services rendered to the national and local associations as assistant secretary for 11 years and as secretary for 20 years.

Lloyd B. Gruman, Jr., acting secretary of the national association, highlighted in his report the extent of the association activities during the past year. Among these activities were the establishment of three annual apprentice contest awards to be made to the three top pipefitter apprentices, the effort that has been devoted to the federal construction contract bill (known as S 848 in the Senate and HR 1825 in the House of Representatives), the new national seal that was adopted in October 1953, and the new national headquarters that were occupied in November 1953.

Air Conditioning Grows

William S. Bodinus, chairman of the air conditioning committee, said in his report that "air conditioning is continuing to grow and that three fields of growth seem to co-exist. The first one is the office building central system category, which approximates four times the volume of the air conditioning business in large installations other than those served by room air conditioners and self contained units. The second one is the industrial system group, and the third is year 'round residential air conditioning."

As has been the custom at HPACCNA conventions in recent years, a number of informal panel sessions on various subjects were on the program.

At the panel discussion on air conditioning, which preceded the report by Mr. Bodinus and at which he presided, it was brought out that all of the systems being installed should consider the comfort of the occupants in both office and industrial applications more than has been done in the past. For office building applications, A. C. Buensod, president of Buensod-Stacey, Inc., stated that the interior space has been neglected in the past, but now it is important that it be considered so as to provide comfort for rooms on the interior as well as the exterior of the building. He advocated the use of the dual duct system and the high velocity induced air system to achieve the flexibility and range of temperature conditions desired for the individual's comfort. He stressed the fact that quality installations are most necessary.

Mr. Bodinus cited the relative proportions of the total loads for the old "L" or "H" type of building; about 60 percent of the total load was attributed to the exterior load and 40 percent was from the interior load. However, with the modern block type of building, only 20 to 30 percent of the total load may be attributed to the exterior load and between 60 and 70 percent may be from the interior load. This stresses the fact that the interior load must be considered very carefully.

Air Conditioning in Industry

Paul Kroeschell, president of Kroeschell Engineering Co., spoke of his experiences in the field of industrial air conditioning and mentioned a few of the industries that were adopting air conditioning as a necessity. Some of those which he has been working with are the pharmaceutical, food, chemical processing and candy—to mention but a few. He referred to the savings that were achieved in the Wrigley gum plant after air conditioning had been installed. Before the installation, three shifts were required to produce less gum than only one shift produces now after air conditioning. Mr. Kroeschell reasoned that is why gum is still 5 cents a package.

Another installation was cited in which the Mars Candy Co. was using a conveyor cooler, and 192,000 candy bars were produced per 8 hr shift. However, after air conditioning was installed, production jumped to 528,000 candy bars per 8 hr shift with only 20 percent of the labor. In addition to this, 24,000 sq ft of floor area was saved, because tables formerly required to dry the candy were no longer necessary.

It was also brought out that industrial air conditioning for the comfort of the workers in plants is becoming more evident all the time. In fact, several cases were mentioned where unions in various localities were demanding air conditioning for the comfort of the workers.

Standards Revised

In his committee report, Mr. Bodinus said that Part IV of the HPACCNA *Engineering Standards*, on Comfort Air Conditioning, was revised and a new booklet was distributed in April 1954. He explained that this standard is not intended to supplant technical publications, textbooks, guides or data books that have been prepared on the theory, design and installation of air conditioning. It contains a simple means of calculating comfort cooling loads. Therefore, it is the purpose of the booklet to provide an easy and complete reference for the preparation of comfort air conditioning calculations which is easy to use and has all of the necessary data between its covers.

Austin S. Ford, chairman of the refrigeration committee, reported that the refrigeration section of the *Instruction Manual for Pipefitter Apprentices* has been revised and rewritten in an effort to keep abreast of the rapid growth of this phase of the contractor's business.

Pipe Welding Report

Richard S. Tobin, chairman, gave the report of the welding committee. He said that no new material had been issued, but he would like to refer to the latest revision of Section IX, qualification standard for welding procedures, welders and welding operators, of the ASME boiler and pressure vessel code.

The first thing to note is that the code differentiates between welders

TABLE 1—CLASS according to volume of business and type of organization

Class	Volume of sales	No. of returns	Type of Business Organization Corporation	Partnership	Individual
I	Under $100,000	13	3	4	6
II	$100,000. to 249,999.99	33	9	6	18
III	$250,000. to 499,999.99	42	26	8	8
IV	$500,000. to 749,999.99	24	17	5	2
V	$750,000. to 999,999.99	18	16	1	1
VI	$1,000,000. to 2,499,999.99	29	26	2	1
VII	$2,500,000. to 4,999,999.99	11	9	2	0
VIII	Over $5,000,000	6	6	0	0
	Totals	176	112	28	36

and welding operators in the title of Section IX. The reason for this is that a welder is one who uses manually operated tools such as an oxy-acetylene welding torch, metallic arc electrode holder or inert gas shielded arc torch or holders. A welding operator is one who operates an automatic or semi-automatic submerged arc or inert gas shielded welding machine. This change is only one of the many revisions and additions that have been made in this section of the code.

Mr. Tobin cautioned against making any changes in a procedure which has previously been used to qualify welders without first carefully checking the change against the "essential variables" in Section IX in order to be sure that such changes will not require requalification of the procedure.

The methods and requirements for welder qualification tests have been entirely revised. Anyone concerned with welder testing should become thoroughly familiar with the new requirements, compliance with which should reduce the costs of testing, he said.

Pipe Welding Bureau

W. R. Stevens, chairman of the board of trustees of the National Certified Pipe Welding Bureau, reported that in the near future a qualified procedure on downhill welding will be available. He pointed out that downhill welding offers a faster and more economical method to do some pipe welding and that this new procedure has been found to be necessary. Thus, changes in the practices of pipe welding bring about the necessity of rewriting and requalifying some of the present procedures as well as developing and qualifying of new procedures. Changes in the ASME code from time to time cause the bureau's methods of qualifying welding operators to be changed with a possible reduction in this cost.

He reported that the bureau is continuing to grow. There are now 24 chapters with over 300 members and close to 2000 qualified welders. He said that the necessity of complying with the code on pipe welding is spreading fast, and he advised the formation of chapters in other areas. He pointed out that it usually takes some time for a new chapter to become active after it is organized.

Apprentice Training

The work of the committee on apprenticeship was reported by J. J. Hanighen, Jr., chairman. He said that supplemental text material to the three volumes of related training courses for the steamfitter apprenticeship program have been completed. The subjects covered were not chosen at random, but were the result of joint efforts of the HPACCNA and the United Association in the many joint apprenticeship courses throughout the U. S.

A very important contribution toward the furtherance of the apprenticeship program in the U. S. and Canada should be noted, he said. Plans were formulated for stimulating the apprentice training program through a cooperative and united effort between the UA and the HPACCNA to conduct an international joint apprenticeship pipefitter contest this year. A joint committee has worked out the plans and the contest award rules for the examination. The UA has secured Purdue University for the site of the first international examination contest and award, which will be conducted August 10, 11 and 12 on the Purdue campus. The contest is now proceeding on the local and state levels, from which winners of the state contests will be sent to Purdue.

"Gigantic Growth" of HPAC

Proof of the gigantic growth of the heating, piping and air conditioning industry during 1953 was solidly established when the annual overhead survey of the business of association members for 1953 was tabulated. A response of 176 out of a total of over 1250 members — about 14 percent — indicated that the total volume of business of the nationwide association approximates $1¼ billion. This figure is obtained by projecting the returns to include the total membership.

The replies were divided into eight classes according to volume of business reported, the numbers and types of business organizations being shown in Table 1.

The purchase of materials from manufacturers and suppliers shows a total outlay of about $700 million for the year 1953. This represents an increase of nearly $75 million over the purchase figures reported in 1952. The productive payroll was shown to be about $300 million, which was about $30 million less than that reported in 1952. The quality of credit is high, as 95 percent of those replying stated that they discounted their bills.

The turnover for the 176 organizations whose questionnaires were tabulated is 4.8.

In presenting the figures for operating expense in Table 4, three columns have been added, one showing the number of reports used, another giving the average sales volume for each class, and another giving the average operating expense for each class. Having these averages, the contractor can more readily place his own business, not only in the class but as above or below the average of the class.

TABLE 2—TOTALS for 176 concerns

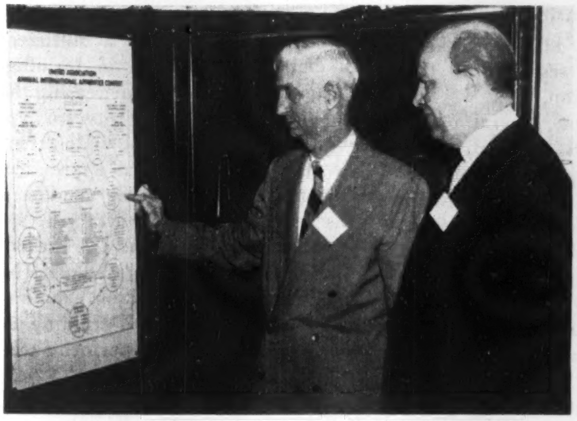
Net worth	$ 35,677,716.10
Volume of sales	171,617,682.78
Operating expense	20,867,838.21
Productive pay roll	42,813,418.85
Purchase of materials	100,315,711.42

TABLE 3—TURNOVER or ratio of volume of sales to net worth

Class	I	II	III	IV	V	VI	VII	VIII
Ratio	2.3	2.3	3.5	3.7	4.6	4.5	6.7	6.5

TABLE 4—OVERHEAD (operating expense: average for class and percent to sales and to cost)

			Operating expense		
				Percent	
Class	No. of reports	Average sales volume	Average operating expense	To sales	To cost
I	13	$ 71,345.64	$ 13,687.18	19.18	26.72
II	33	164,033.61	26,384.97	16.08	20.67
III	42	358,049.61	55,367.86	15.46	19.63
IV	24	619,847.20	84,386.13	13.61	16.95
V	18	874,745.22	122,222.48	13.97	17.05
VI	29	1,562,200.20	198,216.83	12.69	15.48
VII	11	3,146,198.54	316,707.27	10.06	11.78
VIII	6	6,617,542.50	672,734.67	10.16	11.90



PIPEFITTING COORDINATOR Joseph P. Corcoran of the United Association is shown explaining the plans for the annual international apprentice contest to Thomas Murray, president of the UA Enterprise Assn., New York

RICHARD S. TOBIN, chairman of the pipe welding committee of the national association is shown here leading the panel discussion on welding. Similar panel sessions were held on air conditioning, corrosion, legislation and apprenticeship

Contractors Discuss Ratings

. . . of boiler-burner units. Also, piping standards, trade relations, apprentice training, anti-trust laws, and effective selling.

Many interesting sessions in the form of panels, committee reports and general assemblies were held at the 65th annual convention of the HPACCNA in May.

Boiler-Burner Unit Ratings

According to the report of George P. Nachman, chairman of the boiler output committee, the testing and rating code for boiler-burner units has been completed and printed. This code applies only to equipment used primarily for heating systems. It is a performance code. No restrictions are placed on design or manufacture. Safe limits for stack temperature and CO_2 as well as minimum efficiencies are included. The code will become a part of the standards of the national association and will be distributed to all contractors, consulting engineers and architects requesting it from HPACCNA headquarters.

An important part of the code is the paragraph entitled "responsibilities of manufacturers." It is the purpose of this section of the code to protect the owner, the designing engineer, and the contractor regardless of the method of fabrication and assembly. Also, the manufacturers of the boiler-burner units themselves are helped by the code because of the common basis upon which units may be compared. The listings under "net load recommendations" apply only to the boiler-burner units or combinations for which test data has been submitted.

The committee has also been active in preparing a section to be included in the code on testing and rating baseboard and convector units. Progress is being made on this and it will be completed this year, he said.

Radiant Panel Heating

Peter B. Gordon, chairman of the association's radiant panel heating committee, reported that Part VI of the *Engineering Standards — Radiant Heating* has now reached the final rewriting stage. The committee has also prepared and has received approval on an outline for radiant panel heating information and snow melting information to be incorporated in the proposed revision of the instruction manual for apprentices.

Piping Standards Revised

Rowland Tompkins, HPACCNA representative on the ASA council, reported that during the past year the following ASA standards have been revised:

a) B16.12, Cast Iron Screwed Drainage Fittings.

b) B16.5, Steel Pipe Flanges and Flanged Fittings.

c) B9, Safety Code for Mechanical Refrigeration.

Mr. Tompkins said that several cast iron eccentric reducing couplings have been requested to be added to the list of 125 lb cast iron screwed fittings under B16.4. They are 2 in.

x 1/2 in., 1 1/2 in. x 1/2 in., 1 1/4 in. x 1/2 in. and 1 in. x 1/2 in. He also reported that a request had been made that a standard of terminology in the field of automatic control be developed.

Trade Relations

Wray Scott, chairman of the association's trade relations committee, reported that the efforts to obtain skeleton contract forms for heating, piping and air conditioning work has not been very successful. It was the purpose of this endeavor to develop a more satisfactory contract form than that offered by the American Institute of Architects or the general contractors and which would be "safe and sound" from the mechanical contractor's viewpoint. He asked for greater cooperation on this project.

Mr. Scott also reported on the activities of his committee with reference to the complaint that the federal government — as represented by its various contracting agencies — was buying much material on the open market and then requesting bids from contractors on a lump sum basis with a guaranteed completion date. He said that this of course is unfair to expect any contractor to guarantee a completion date and guarantee satisfactory performance of a mechanical system when he does not have any control over the purchase or delivery date of the component parts. Progress is being made in getting this clarified and corrected.

Publicity Valuable

A report on the activities of the Plumbing and Heating Industries Bureau was given by Arnold H. Goelz. He pointed out that considerable success has been achieved in publicizing two new phases of the business during the last year. One is the use of the boiler for melting snow and ice on sidewalks, driveways, areaways and other outdoor places. The other is the installation of air conditioning equipment utilizing chilled water.

Mr. Goelz concluded his report by stating that support of the bureau should be regarded as a sound investment in sales promotion. "It is sales insurance," he said.

Durkin on Apprentice Training

Several nationally known speakers addressed various sessions of the HPACCNA convention.

Martin P. Durkin, general president of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry, spoke on the problem of apprentice training. He said that the soundness of investing in apprentice training was clear long ago, and substantial progress has been made in developing jointly a program which yielded genuinely qualified journeymen. It has been demonstrated that the jointly operated apprentice training program is the key to both increased efficiency and lower labor costs. It is a known fact that properly trained mechanics can spell the difference between profits and losses, between good wages and poor wages, he said.

Yet, despite the general acceptance of the idea of apprentice training the fact is that not enough apprentices are now being trained. We are not training enough apprentices to meet the demands of our nation in time of peace or in time of national defense, he stated.

The undeniable fact is that qualified journeymen do not "just happen." They are end-products of years of training. Also, advances in the industry require an ever-changing distribution of time between on-the-job training and related training. Perhaps nothing better illustrates the point than the simple fact that a journeyman who cannot weld pipe connections or who cannot understand plan reading is simply not a fully-fledged journeyman.

There are many, many other illustrations of the march of progress in the industry and the ever-rising level of performance required from journeymen mechanics, he said. The time has long since passed when a journeyman in the industry could perform his job with little or no knowledge of how the piping system operates. The modern qualified journeyman mechanic is not an assembly line worker with no idea of how the completed system operates. One wrong connection is enough to render the entire installation useless and endanger the lives of all those around, he explained.

The first step toward increasing the number of new apprentices could be taken by those employers who now have a sufficient number of journeymen but do not have a sufficient number of apprentices in training.

Another step toward increasing the number of new applicants for apprentice training in the industry is the current international apprenticeship contest that is being conducted this year, he said. All fifth year apprentice members of the UA are eligible in the U. S. and in Canada. The tests will include a written examination based upon related training as well as a "practical performance" test.

The contest is but the beginning, he pointed out. Once interest has been stimulated, every effort will be made to improve the apprentice training program itself — with especial emphasis upon genuine related training aspects of apprenticeship.

Mr. Durkin said in conclusion that the UA stands ready "to do more than its share in advancing the safety and welfare of the nation by developing an apprentice training program that is not only adequate in size but unsurpassed in quality."

Utilities Need Cooperation

Bernard H. Wittmann, assistant to the vice president in charge of sales for the Peoples Gas Light and Coke Co., Chicago, told the contractors that both the trade association and the utility company must share a sincere understanding in order to strive for mutual benefits. He said that although much has been said about true contractor-utility cooperation on a national scale, seldom has a real program such as that experienced in the Chicago market been worked out.

Mr. Wittmann said that he felt that heating contractors should give more support to gas utilities, especially in the apartment house market. The demand for gas heating in the Chicago area at the present time — in excess of 150,000 applicants — presents a tremendous market to the heating contractor when the underground storage facilities at Herscher, Ill. become successfully operative, he said.

An investment of $150 million has been made in a new pipe line from Texas to provide additional capacity for 50,000 more customers. In terms of increased capacity, this will mean an increase from 268 million cu ft of gas to 500 million cu ft. Another $137 million investment is anticipated in another line to help service the 136,000 customers on the waiting list. The storage facility at Herscher has cost $17 million up to the present time and has a capacity for storing 90 billion cu ft of gas. It is all underground in a strata about one-third of a mile below the surface. The reason that this storage facility has not been put into operation as yet is that it must be checked thoroughly for all leaks.

Anti-Trust Laws

Kendall B. DeBevoise, partner in the law firm of Breed, Abbot & Morgan, spoke on anti-trust laws. He explained that there are four basic statutes that are considered to be anti-trust laws. First came the Sherman act in 1890; then, in 1914, the Clayton and Federal Trade Commission acts were put into effect. In 1936, the Robinson-Patman act came into being.

He said that the Sherman act is the most familiar to mechanical contractors. Under it, there are two major fields of trade association activity which must be avoided. The first is price fixing or price stabilization. The government can do it, but the individual can't; it's as simple as that, he said. The second field of unlawful collective activity is not as well understood by business men, although the courts have been just as busy with it through the years as with price fixing. It may be described as any collective or group effort to restrict the competitive freedom of either those in the group or those outside. Thus, on the one hand it's a ban on self-policing of an industry and, on the other, a ban on policing of other segments of an industry in their selection of ways and means to do business, he said.

In the mechanical contracting industry, the bid depository has, in one form or another, and on occasion, embodied each of these activities. In its earliest form, the bid depository, what with interchange of bid information before award, actually operated as an instrument for price fixing and dividing up the market. When it became apparent that a bid depository was completely vulnerable under the Sherman act, refinements were developed in an honest attempt to retain the practical benefits of a depository without running afoul of the law. The result is that, under the Sherman act, as now interpreted, no bid depository, no matter how carefully conceived, is free from legal risk.

He indicated that the legal atmosphere in which business must work and compete is changing. This is most noticeable in the Department of Justice and the Federal Trade Commission, the two principal federal instruments for the enforcement of the anti-trust laws. "Trust is replacing distrust in anti-trust," he stated.

There is good evidence of a new and more constructive approach to business law enforcement, an effort to enforce the laws as they were written. Mr. DeBevoise concluded by stating that we are operating in a much clearer legal atmosphere today than yesterday, one which holds greater sympathy for the economic realities of competitive business and a greater confidence in the essentially law abiding nature of the American business man.

Effective Selling

Harold Bergdahl, manager of sales, Crane Co. was called upon to make a few remarks regarding sales methods and how to increase the effectiveness of selling. He stressed the point that should be made when selling, "You'll be happier with such and such a product or service." Selling, he emphasized, in order to be effective, must be in terms of the benefit that will be experienced by the customer. He explained that service can be sold and that the benefits to the user should be cited rather than how long the product has been on the market or other points that do not interest the customer directly.

At the concluding session, Dr. Rex Stowers Clements, pastor of the Bryn Mawr Presbyterian church, Philadelphia, spoke to the convention about the relative differences between "value and meaning" and "matter and force." He explained that the value and meaning concept may be thought of as the qualitative aspect, while matter and force may be considered to be the quantitative measure. In closing, he suggested that we think of our daily activities in our work, recreation, community and church activities in terms of the value and meaning concept and with a faith in the American way of life.

W. F. van der Horst, from Johannesburg, South Africa, expressed his pleasure at attending the convention after being introduced as the person farthest from home.

New Officers, Directors

J. DeWitt Morrow, president of the Warren Co., Houston, was elected president of the national association, succeeding Robert W. Lawinger, president of the S. J. Reynolds Co., Chicago.

The new HPACCNA vice president is Edward Jungbert, Coral Ridge, Ky. Herman W. Goldner, president of the Herman Goldner Co., Philadelphia who has served as treasurer during the past year, resigned as a candidate for the position of vice president on account of ill health. The newly elected treasurer is George Hall, Madison, Wis.

Serving the national association as newly elected board members for three year terms are Merrill W. McKinstry, Seattle; Douglas W. Bell, Denver; George J. Johnstone, Minneapolis; J. DeWitt Morrow, Houston; Gustav Nottberg, Kansas City; and K. A. Stevenson, Atlanta. Joseph S. Kearney, Chicago was appointed to fill the unexpired term created by the resignation of Mr. Lawinger. Mr. McKinstry replaces W. E. Beggs, Seattle.

Lloyd B. Gruman, Jr., was elected HPACCNA secretary, and Joseph C. Fitts was made a consultant to the association.

Ray L. Spitzley Honored

The association's distinguished service award for 1954 was presented to Ray L. Spitzley, retired head of R. L. Spitzley Heating Co., Detroit. The award was received on his behalf by Joseph H. Spitzley, his son, from past president George P. Nachman. Mr. Spitzley was cited for giving freely of his time and energy to aid and upbuild the national association through his services as a director and president for 18 years and through his work on many committees.

Houston Next Year

The association's 66th annual convention is to be held at the Shamrock Hotel in Houston on May 9-13, 1955.

Planning the Shopping Center

Water Supply and Conservation

• This is one of a group of articles on the factors to be considered in planning a modern shopping center, with particular emphasis on the air conditioning, heating and piping facilities. An overall approach to the problem was presented in April, with a general outline of the engineering considerations. The subject of underground utilities was discussed in June, and this month such factors as sizing the piping for water supply, water conservation results and others affecting air conditioning are covered. Subsequent articles will be devoted to other considerations and to detailed descriptions of several shopping centers, the designs of the mechanical equipment for which the author's staff has completed.

By R. J. Abramson
R. J. Abramson & Associates
Consulting Engineers

THE SHOPPING CENTER OWNER and engineers must decide two questions when planning for the water supply and disposal for the center. They are (a) Will all tenants be required to install water saving devices for air conditioning equipment?, and (b) Will all tenants be required to accept tank closets and urinals?

For example, assume that a shopping center will require a total of 400 tons in individual systems of air conditioning. Shall we design the main capacity for 800 gpm — 2 gpm per ton, as used in Chicago — or 4 gpm per ton when atmospheric cooling towers are used, or 3 gpm per ton for mechanical draft towers? Shall branch water main sizes be 1¼ in. minimum for a single flush valve water closet toilet room or ¾ in. for a single tank water closet toilet room?

Water Saving Device Pays

At a shopping center in Chicago, it was decided that all tenants must use water saving devices for their air conditioning systems and for all refrigeration compressors over 1 hp per tenant. Also, all water closets and urinals are to be of only the tank type.

By following this line of design reasoning, the size of the water service was reduced from an 8 in. diameter to a 4 in. cast iron main; the size of the meter vault and meters were also reduced proportionately of course, and a saving in the installed cost of 40 percent was made. This system has been in operation for over 2½ yr without any complaint from the tenants. As a leasing aid for the owner, a simple form letter was written to show that savings in water costs would pay for the average water saving device in four seasons of operation, yielding a 25 percent return on the tenant's investment in a water saving device.

When local rules are favorable, bulk water metering by the utility with submetering by the owner will yield additional revenue. In one installation, this revenue amounted to $3800 per annum net, after billing and servicing the meters.

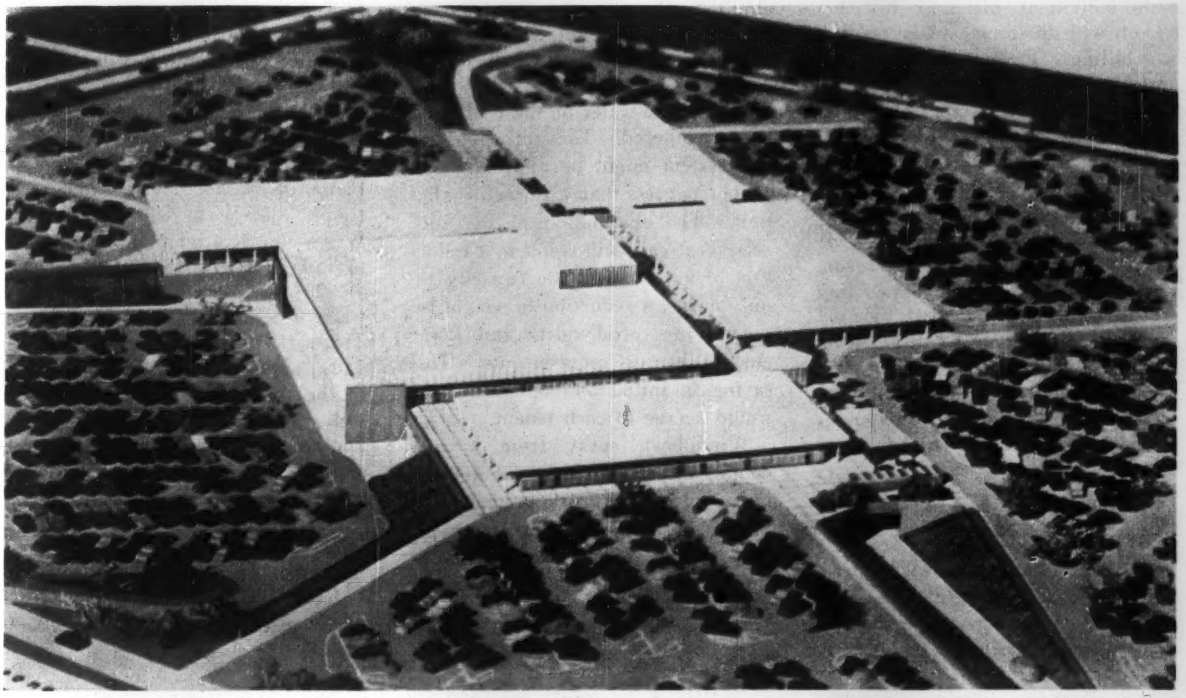
Access to Piping Important

Location of water mains and branches is a problem when slab-on-grade construtіon is used. As tenancy will change, ease of access is the paramount consideration. One solution to this problem is the use of a furred pipe space 2 ft deep by 2 ft wide along the rear wall at the ceiling, with hinged and grilled access panels for each bay of approximately 20 ft. This pipe space may also contain the electric subfeeders and gas piping. Sectionalizing valves are installed for every four bays, and tees with brass plugs in the branch outlets are installed in place of couplings, in both the gas and water mains, at the above-mentioned shopping center in Chicago.

Estimating Units Provided

Several handy estimating units based on typical structures and sales divisions for a typical shopping center are available to the consulting engineer. A sample structure would contain five fire areas of say, 100 ft by 140 ft deep; each 100 ft fire area would have five 20 ft bays. As any individual bay could be a separate tenant, or conversely, one tenant could occupy the entire fire area, a study was made of diverse types of commercial occupancy. A reasonable group of estimating units are:

a) Sanitary — 12 fixture units per bay.



WATER SUPPLY and conservation must be considered in planning for the modern shopping center

b) Process water make-up from potable water — 1.2 gpm per bay.

c) Allowance for food store or restaurant *per building* — 55 fixture units.

An example can best illustrate this point. A building with five fire area units is assumed. 25 bays × 12 = 300 fixture units; Allowance = 55 fixture units; Total 355 fixture units. From a demand load curve for predominantly flush tanks, the demand is 98 gpm. 25 bays × 1.2 = 30 gpm make-up water; 98 plus 30 = 128 gpm per building total potable water demand. The friction loss chart for "fairly rough pipe" (ASHVE *Guide*) indicates that a 3 in. diameter main with a pressure loss of 2 psig per 100 ft length would be required.

Design for Ample Pressure

From the above example, if flush valves were used, the demand would be 120 gpm plus the 30 gpm allowance would equal 150 gpm, and from the same friction loss chart, a 3½ in. main would be selected with the same pressure drop. However, for ease of purchase, a 4 in. main with a loss of 1 psig per 100 ft would be used.

It must be remembered that most shopping centers usually have a 300 to 400 ft parking set-back from the street. Add to this the usual 500 ft of building plus a terminal piping run of 100 ft, which would give a total of 1000 ft! Allowing for elbows, valves, etc., add 250 equivalent ft or a grand total of 1250 ft or a total pressure loss of about 25 psig.

In many of the larger cities, the available water pressure is from 35 to 45 psig. At the last tap, a maximum of 20 psig should be available. The cooling tower inlet will average from 22 to 25 ft above grade, consuming another 10 psig. This would leave 10 psig, maximum, available for the roof equipment. That is a very small margin.

Piping for Fire Protection

In many localities the question of fire protection would govern the potable water main size. Assume that one fire subdivision — 100 ft × 140 ft = 14,000 sq ft — has a merchandise basement and first floor. Allowing 80 sq ft per sprinkler head, 175 sprinklers would be required per floor. Assuming the ordinary hazard sprinkler design, a 6 in. diameter water main would be required.

In some cities, fire hydrants would be required at 250 ft intervals of merchandise frontage. For the usual set-back arrangement for a 500 ft building, three to four fire hydrants would be required. Each hydrant has two hose connections with a capacity of 200 gpm or a total of 400 gpm. Three hydrants would have a capacity of 1200 gpm; a 6 in. diameter main would deliver this quantity of water with a 7 psig loss per 100 ft.

The economic aspects of fire protection should always be investigated. Even though it may not be required by local ordinance, the difference in premium costs for building and contents insurance can easily be of such magnitude as to pay for the sprinkler installation in three to four years.

Water for Air Conditioning

Process water as a constant source of revenue with minimum maintenance and elimination of different sized roof cooling towers and evaporative condensers has been overlooked. Assume that the shopping center will require a total of 300 tons of air conditioning and refrigeration capacity.

An installation in Chicago might require a 900 gpm cooling tower, water pumps, distribution system with individual metering to each tenant, with bi-annual meter reading and billing. The system might cost approximately $20,000 in Chicago. Based on a 30 year life, an annual profit on the investment, replacement, operation, and maintenance cost of 10 percent, and $100 per yr meter reading and billing, the required average revenue would be $3100 or $124 per bay, per cooling season. City water cost per bay per cooling season would be about $164, or a net saving to the tenant of $40 per cooling season might result through the use of a cooling tower. This differential would be considerably greater for inland cities with their higher water costs.

Roof Sprays Save Water

Further initial savings in the process water system can be obtained with the help of the architects. If the roof system can be designed for an additional 16 lb per sq ft, a roof spray system with a maximum of 3 in. water depth will provide ample process water at the desired temperature and eliminate about one-fourth of the insulation thickness on the roof and add five to seven years to the useful roofing life. Of course, the winter cycle with no water on the roof must be remembered. The initial cost of this system might be approximately 15 percent less than a tower installation. The elimination of the roof solar heat gain will result in a reduction of air conditioning capacity requirements, a reduction in weight required for metal ducts and lower electric energy requirements. This saving in initial and operating cost would accrue to each tenant.

Windblown spray from a roof cooling system would be the greatest objection to its installation. The architectural use of parapet walls 3 to 4 ft high above the roof on all four sides — for individual tenant signs — affords a natural barrier. The use of flat pattern spray heads pointed down and placed from 12 to 16 in. above the roof gives good air to water contact and an average ponding water temperature to within 12 F of the wet bulb temperature. The down-pointing heads are simple and provide a self draining system.

Well Water Sometimes Used

At a shopping center in North Platte, Nebraska, nature provided a simple answer to summer cooling. Well water at a temperature of 54 F to 56 F in August from shallow wells — 25 ft deep with the operating water line at 18 ft — is this answer. Three 18 in. diameter wells deliver 110 gpm of cooling water to one of the stores. One 18 in. diameter well delivers 45 gpm cooling water to another store. One 4 in. driven well supplies 18 gpm for the hardware store.

A store in Minneapolis is cooled from a deep well in the rear basement that delivers 200 gpm of 58 F water. The well and turbine well pump cost approximately $8500 three years ago.

Engineers are well aware that the economical cooling medium is a function of locality, local usage, experience and local codes.

Nine-Acre Exhibit Hall for New York

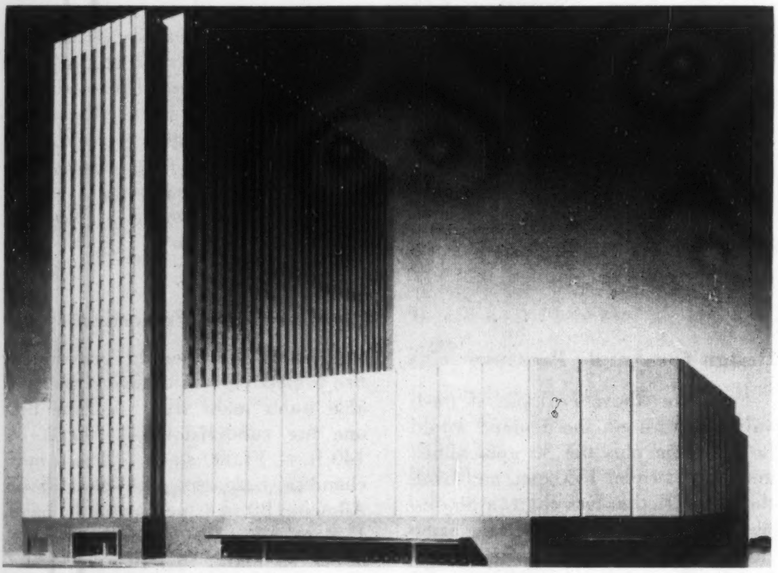
. . . is announced

CONSTRUCTION BY the Triborough Bridge and Tunnel Authority of a $30 million "conservative modern" gray brick, air conditioned building at Columbus Circle to house a four-level, nine-acre coliseum, the first public exhibit area of its kind in New York, should be completed in about two years, it was announced recently. Capable of handling several major exhibits or seating 10,000 people, it will have a block-and-a-half long lobby as wide as a city street.

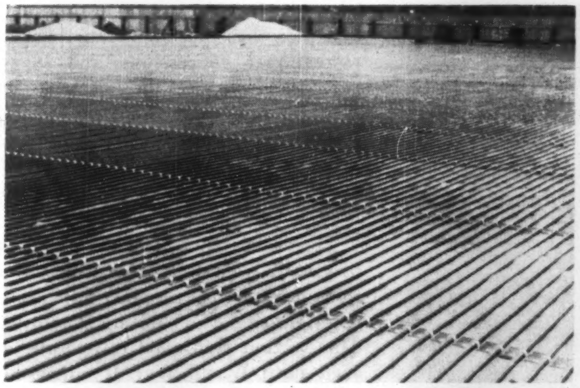
Plans for the structure include a 20 story office building, a public parking garage and off-street truck handling facilities for the office building as well as the coliseum, according to Robert Moses, chairman.

Two 14 story apartment buildings financed by private capital will adjoin the new public facility.

Grand Central Palace, for many years available for large exhibits, recently was converted to office space.

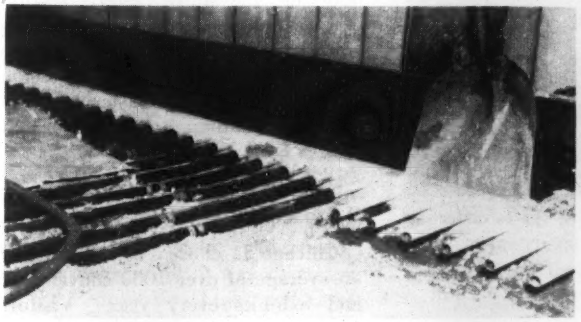


EXPECTED TO BE completed in two years, the new air conditioned facility will be capable of handling major exhibits. Here, a model is shown of the new hall as it will appear when construction is finished

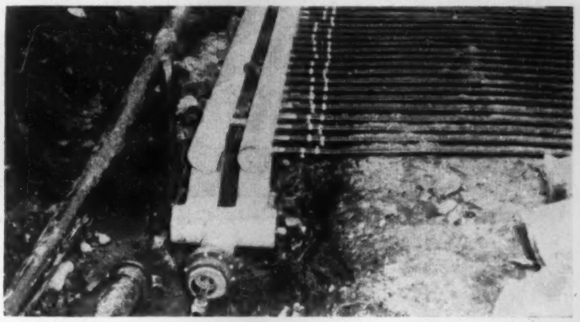


PLASTIC PIPE on 4 in. centers covers the 200 by 100 ft area of the ice skating rink in this construction view

TWO WORKMEN prepare the nipples welded to the steel pipe header prior to connecting the 1 in. ID plastic pipes on 4 in. centers



ENDS OF THE 200 ft plastic pipe runs are slipped over the nipples on the header, being fastened by a cement



A CLOSE-UP of the header arrangement at the other end of the rink, showing the clamps which also fasten the pipes

ON THE JOB

Plastic Pipe Serves New Outdoor Skating Rink

. . . brine to be circulated

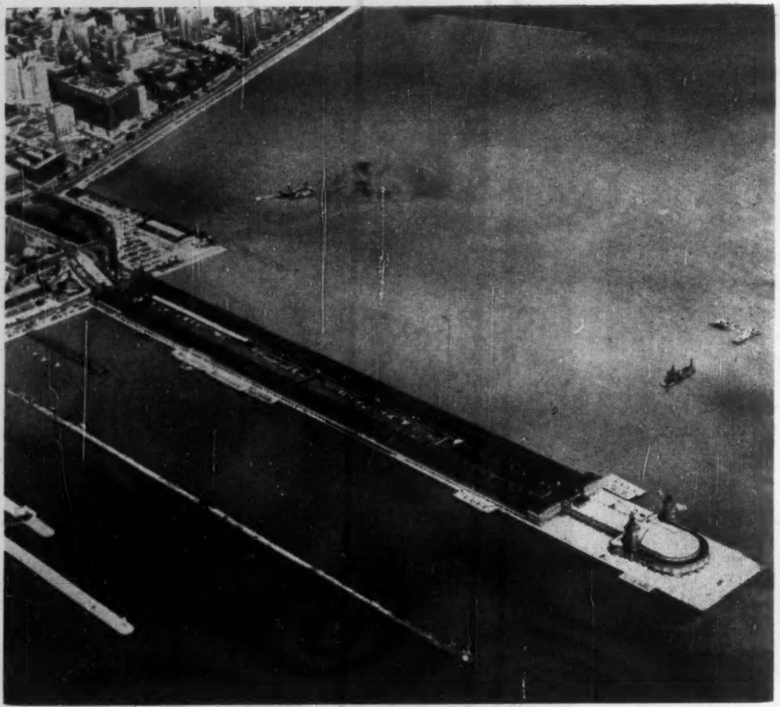
An outdoor ice skating rink using plastic pipe is under construction on Chicago's south side, at 74th and Ada Sts. It, is planned for use throughout the year, except for the three summer months, refrigeration capacity being available from the adjoining plant of the Fulton Pure Ice Co. Calcium chloride brine is to be circulated through the rink piping.

The rink itself is 100 by 200 ft, and 1 in. ID plastic pipe is on 4 in. centers, connected to steel pipe headers at each end. The rink is on a cinder fill, over which was placed 2½ in. of sand. The plastic pipe was then placed in position, and fastened by clamps to wood stringers. Sand is then placed over the pipe, and is wetted and frozen, to form a base for the skating ice.

Nipples are welded at 4 in. intervals to the headers. The ends of each 200 ft run of plastic pipe are slipped over these nipples and cemented to them. A special screw clamp around the plastic pipe end secures the pipe to the nipple.

A portable electric steamer was used on the job to soften the plastic pipe during installation in the cold.

The Buildice Co., which holds patents, did the engineering.



1 THE PIER — over half a mile long — is one of the longest spaces under one roof ever heated

Heating "All Outdoors"

. . . at Chicago's Navy Pier

By M. W. Oettershagen
Harbor Engineer, City of Chicago, and

H. C. Gurney
Janitrol Heating Div., Surface Combustion Corp.

• Because of its location, type of construction and intended intermittent use, the City of Chicago and the heating engineers of the local gas utility were confronted with a major problem in designing and installing an efficient heating system for the second deck of the Navy Pier. The problem was successfully resolved by installing gas fired unit heaters.

How would you heat a structure that is constructed of concrete, steel and acres of glass and is exposed on three sides to the 45 mph Lake Michigan winds? This was the perplexing task that faced City of Chicago engineers when it was decided to heat the exhibition halls on the Navy Pier.

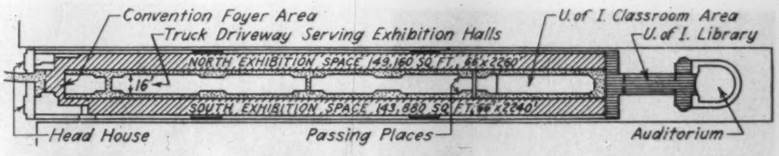
The pier was originally designed as a terminal for Great Lakes freight and passenger service. Construction was started in 1914. Besides being used for its original purpose as a lake shipping and passenger terminal, the pier has accommodated large recreational concessions and Navy personnel during the periods of World Wars I and II. Prior to the installation of the heating system, the first exhibition in 1920 — and all subsequent ones — were held during the summer months.

The easterly 660 ft of the pier was originally used as a recreational section, containing a dance pavilion, entertainment and dining facilities. This section continued to operate as such until World War II when the Navy — from the spring of 1941 to November 1946 — used it for various training schools. Now the University of Illinois occupies the first floor and the entire easterly section of classrooms, library and other facilities for physical education. This article does not include a discussion of the heating in this easterly section of the pier, although it is also heated by gas fired equipment.

Why Heat the Pier?

Chicago is chosen as the site for an average of over 1000 conventions and exhibits every year. Visitors to these affairs, according to the convention bureau, spend approximately $160 per capita while in the city. There are some conventions that are held in Chicago, which — because of their size — require the type of display space available only at the Navy Pier. Most of these shows — six out of seven in 1953 — are held during the heating season. An average of 14,700 visitors are drawn into the city for each of these major shows.

The exhibition space occupies the second floor level of the pier and is divided into two sections, as shown in Fig. 2 The overall dimensions of the north exhibition space are 66 ft × 2260 ft, and the overall dimensions for the south exhibition space are 66 ft × 2240 ft. These areas are located 18 ft above the center roadway. The construction consists of a structural steel frame composed of longitudinal and transverse steel beams supporting a concrete floor. The sidewalls — 18 ft 6 in. high — are of glass with metal frames. The service driveway extends along the exterior of the space and large sliding doors provide convenient access to the exhibition space at regular intervals. The concrete slab roof slopes to a canopied skylight which runs the length of the monitor. There is no insulation. However, the plywood paneling which forms the lower backwall for the exhibit spaces does provide some small resistance to heat flow.


Convention Foyer Area
Truck Driveway Serving Exhibition Halls
U. of I. Classroom Area
U. of I. Library
NORTH EXHIBITION SPACE 149,160 SQ FT, 66'x2260'
16'
SOUTH EXHIBITION SPACE 143,880 SQ FT, 66'x2240'
Head House
Passing Places
Auditorium

2 THE NORTH EXHIBITION space was the first to be equipped with unit heaters. Later, units were installed in the south exhibition space and the convention foyer

3 THE TWIN UNITS are placed 40 ft apart along the inside walls and 10 ft above the floor. Note the expansion loops which had to be installed in the 6 in. and 12 in. gas lines that extend around the pier

Unit Heaters Installed

The total estimated heat loss of the combined north and south exhibition halls is 38 million Btu per hr. The narrowness of the buildings made it undesirable to use any heating equipment which would utilize any of the available floor space. Accurate measurement of fuel used for each exhibition, fuel storage and delivery problems ruled out any fuel other than gas. Gas fired unit heaters were chosen as the method of heating this "outdoor space."

In March of 1936 the first group of gas fired unit heaters was installed in the north exhibition space. In order to be sure that an adequate supply of gas would be available for the new installation, it was necessary for the Peoples Gas Light and Coke Co. to lay 7000 ft of medium pressure gas main — 3000 ft of 12 in. and 4000 ft of 6 in. main. It is interesting to note that in the exhibition spaces, expansion loops — shown in Fig. 3 — had to be provided in these lines because the total range of expansion for these premises had been measured at 16 in. during the annual temperature range of –10 to 100 F.

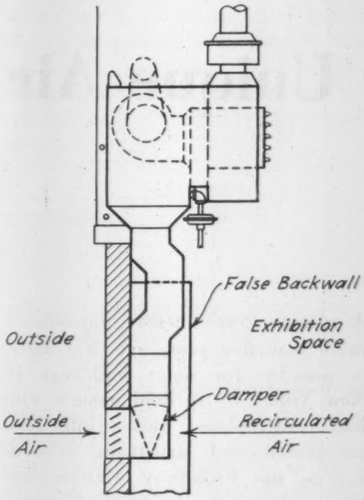
The heating equipment in the north exhibition space system consists of 60 twin unit heaters which were especially designed and manufactured for this installation. The twin heaters were made by coupling two standard 200,000 Btu units — then the largest made — into a single steel jacket to operate in unison. These heaters are 40 ft apart along the inside wall of the exhibition space. Each twin unit has a fuel input rating of 400,000 Btu per hr. Air is circulated by two squirrel cage rotary blowers mounted on a single shaft, and driven by a 1 hp motor at a speed of 600 rpm. Each twin unit heats and circulates air at the rate of 5800 cfm.

The heaters are hung from steel roof members 10 ft above the floor. Air is supplied to the heaters by a return air intake extending from each heater to within 3 ft of the floor. Each intake is supplied with a manually controlled damper so that either inside or outside air may be circulated. The cross sectional dimensions of the intake are 4 ft by 1 ft.

117 Unit Heaters Now In Use

Additional twin units were placed in the south exhibition space and the foyer building in succeeding years. A total of 117 heaters have now been installed. All of the original units are still operating, giving satisfactory performance with a minimum amount of maintenance required. It has only been necessary to provide routine maintenance such as oiling, cleaning and periodic inspection since the units were put into service.

The unit heaters maintain a temperature of 70 F within the exposition space, even with the outside temperature at 10 below zero F. All controls are installed on a panel below each heater about 8 ft above the floor.



4 EACH UNIT HEATER is provided with a manually controlled damper in the intake so that either inside or outside air may be circulated

The fans on the heaters are used during the summer for ventilating the halls. For exhibits such as flower shows, which require varied amounts of heat, groups of the heaters for some areas are not used, thus providing flexibility of the system.

RENTAL AIR CONDITIONING units are installed in all types of structures. Here, a garment plant is shown. The owner may take title to the equipment after five years

Unique Air Conditioning Rental Plan

. . . scores success in New York

A MODERNIZING SCHEME, introduced more than five years ago, has made it possible for older buildings in New York City to hold tenants who had contemplated moves into new air conditioned structures, according to the Broadway Maintenance Corp. The company's unique rental plan has little competition because the maintenance organization is set up to handle such a mammoth undertaking with assurance of continued reliability.

Ownership or Rental

There is a two-fold appeal for any customer to have this organization bid on a job. First of all, he gets a proposal that offers outright ownership of the air conditioning and/or heating system. Second, he is offered a rental contract whereby the system is installed and maintained for a fixed charge over a five year period.

Since the customer always has the option of ownership or rental, great importance is placed on the plans and specifications which are aimed to guarantee maximum user-satisfaction at low cost. There is no incentive to underbid an installation purely for profit, only to lose it on high maintenance costs should the customer elect the rental plan.

The sizeable increase in the rental plan business during the past five years is partly due to a growing customer's desire to avoid unnecessary capital expenditures. A minimum of $1.66 must be earned for every dollar spent in this manner, according to proponents of the rental plan. On this basis, assume a case where a $100,000 air conditioning system is under consideration. The business firm must earn at least $166,000 after taxes in order to cover the air conditioning investment. Contrasted to this, the same air conditioning system will be installed and maintained on the rental plan for a $40,000 annual operating charge before taxes, over a five year period.

The rental plan is also flexible to fit the customer's needs. He can have maintenance service for five years or for a longer period of time as he chooses. The plan also per-

ROUTINE MAINTENANCE on rental air conditioning units is performed as a part of the five year rental contract, as are service calls for trouble

mits him to take over complete ownership of the system, should he desire to do so.

Income Increased

Rental rates being paid in older New York buildings are substantially lower than in air conditioned structures. The difference between these low rental rates for non-air conditioned space and the rates for air conditioned buildings will frequently pay the entire cost of new, leased air conditioning installations and show the owner an increase in his income over the cost of the rented equipment.

One industrial plant in the New York area found itself in a difficult situation recently. It was making products under government contract and was having 60 percent of the output rejected due to corrosion by sea coast air and dust. To get government approval on a capital expenditure would have taken months and financial losses would have been large during the delay. Experts were consulted, a rental contract was signed, and the air conditioning system was installed in record time. Plant rejects dropped to an insignificant level and costs are being paid as an operating expense.

Ownership After Five Years

At the end of five years, the rental plan permits the user to continue the yearly maintenance contract at a reduced rate or take title to the air conditioning installation.

In discussing the details of the rental arrangement, Sidney P. Lipkins, president of the Broadway Maintenance Corp., summed up the matter in these words: "It may be advisable for a company to use the money it would invest in an air conditioning system by putting it to work in the company's business. Part of the profits from this investment may be applied as payments on the rental plan."

School Construction Volume Increases

. . . '54 ahead of '53

CONTRACT AWARDS for future school construction in the 37 eastern states set new records far above last year's levels during April as well as during the first four months of this year, according to the F. W. Dodge Corp. Contract awards reported in April for school and college buildings — including additions and major alterations — totalled $156,554,000, setting a new record for any April in Dodge's 63 year history. This total was 17 percent above the previous April record set last year, and on a four month basis, 1954 was running ahead of 1953 by about 34 percent.

George Cline Smith, Dodge economist, predicted that this boom in school construction, already of long standing, would continue as states and communities try to keep pace with the increasing child population.

"School construction," Mr. Smith said, "has not only grown greatly in volume, but has increased its importance as a segment of the construction industry. In April 1946, construction awards for school and college buildings accounted for only 4 percent of nonresidential contract awards and 1 percent of total construction awards. By April of last year, they accounted for 20 percent of nonresidential and 8 percent of total construction awards. In the year since then, school and college buildings climbed to 26 percent of nonresidential and 9 percent of total construction awards.

"Contract awards for school and college buildings have grown from a mere $9 million in April 1946 to $156 million in April of this year. The growth has been steady, with an increase recorded in every April except one since 1946. Because of the sharp seasonal movements in construction, comparisons with the corresponding month of earlier years is the best indication of the trend.

"This trend in school construction toward both absolute and relative growth may be expected to continue. The Census Bureau estimates that the number of children in every elementary and high school grade will continue to increase each year at least until 1960, and that total enrollment will increase at least until 1965," he predicted.

Burning

ENTRANCE
Indoor Comfort EXPOSITION
HEATING MAY 16-20 COOLING
32nd ANNUAL OHI CONVENTION
20th OIL HEAT SHOW
OIL CONVENTION

A PANEL SESSION on burning heavier oils, to which engineers and architects were invited by exhibitors, was a popular feature of the oil heating exposition

An "invitation party" for engineers and architects given by exhibitors of commercial and industrial oil burning equipment proved to be a popular feature of the 20th National Oil-Heat Exposition, which was held in Philadelphia with the 32nd annual convention of the Oil-Heat Institute. A panel of authorities on various phases of the problem of burning heavier oils answered numerous questions from the audience — following which cocktails and a buffet supper were served.

Pesterfield Presides

In introducing the panel and the subject, Charles H. Pesterfield, professor of mechanical engineering at Michigan State, the chairman, pointed out that the heavy oils vary widely in their characteristics in different parts of the country. You can't always mix two oils, he warned, for the mixture may result "in an oil that has to be shovelled out of the tank." The variations in ordinances in different states and cities also complicate the situation, he said. Some of the rules on storage, for example, are "ridiculous," in his opinion.

He mentioned that the "mis-delivery" insurance carried by some oil suppliers covers all losses incurred from a wrong oil drop, including time lost in the plant due to a shutdown, etc.

Following his introductory remarks, Professor Pesterfield invited questions from the audience, which were answered by the various members of the panel.

The first questioner asked about fuel oil sludge solvents, and wondered "If they are good, why don't the oil companies put solvent in all burning oils?" If they are not worthwhile, "Why don't the oil suppliers say so?" he asked. In answering him, a panel member (representing a large oil company) stated that the purpose of such solvents is to make an emulsion of water in the oil tank so that it can be removed. But their use is not necessary in all cases, so the oil suppliers do not add such solvents to all the oil they sell, he said.

Sulphur Corrosion a Problem

Another panel member—a "trouble-shooter" with a firm of consultants on oil burning — said that, in his opinion, the troubles usually experienced in burning the heavy oils were usually due to incorrect operation rather than to the oil itself.

The second questioner reported that he had experienced trouble with No. 6 oil due to sulphur corrosion in the colder parts of boilers (air preheaters, for example.) In reply, the panel member representing the oil suppliers said that "if anyone knows how to take sulphur out of No. 6 oil economically, he will make a fortune." He also warned that the sulphur content of heavy oils "will probably get worse before it gets better."

Another panel member, representing a manufacturer of oil preheating equipment, said that various alloys can be used to combat such corrosion in oil preheaters and other equipment.

The trouble-shooter member of the panel stated, in answer to the same question, that at one plant with which he was familiar, boiler corrosion troubles of this kind had been eliminated by operating three of the seven boilers at higher capacity, rather than all seven at a lower rating. A member of the audience said that in hot water heating plants operating at low temperatures, the problem had similarly been corrected by raising the operating water temperature.

Improve Operation

Another member of the audience expressed the opinion that most oil burning troubles can be corrected by improved operating methods. He mentioned a plant where the tubes are cleaned every two weeks with a

the Heavier Oils

. . . presents such problems as sulphur corrosion and the need for preheat. Panel session stresses importance of good operation

vacuum cleaner, and the cups are cleaned every day. Good maintenance, he stressed, solves most oil burner troubles.

The trouble-shooter member of the panel confirmed this point. Good supervision is essential, he said, and he warned against the "Bypass Charley" found in too many plants who seems to want to bypass any equipment (such as the controls) if he doesn't like it.

The matter of evaluating additives with respect to sludge was asked about, but the panel had no definite suggestions on how to do this.

Long-Range Service Contracts

The next question pertained to long-range service contracts for heavy oil burning installations. A member of the panel stated, in reply, that formerly "it was easier to sign up real estate management companies under such contracts, but that now the problem was to get qualified servicemen who know today's more complicated controls to man the service organization." Unless such men can be trained, he foresees trouble. Too many burners are being installed, he feels, by men who don't know today's electronic and other controls thoroughly.

A member of the audience mentioned that his firm offers a five-year all-inclusive service contract, the reception to which "has been very good."

No. 5 Require Preheat?

Another member of the audience mentioned that in one state there had been considerable trouble in burning No. 5 and No. 6 oils — to the extent that the state architect was threatening to go to other fuels, and was writing No. 4 oil into specifications. Professor Pesterfield agreed that No. 4 was being used "quite a bit" instead of No. 5 or No. 6.

The final questioner asked what could be done "to clear up the confusion about so-called No. 5 oil." He said that No. 5 oil didn't use to require preheating, but these days no one seems to know whether or not it should be preheated. "Why don't the oil companies call an oil No. 4 if it doesn't require preheat, and No. 5 if it does?" he asked.

Professor Pesterfield, commenting on this question, said that whether or not an oil requires preheating is the responsibility of the heating contractor, who must be closely familiar with the characteristics of the oil to be used in the heating and fuel burning installations that he makes.

Although there seemed to be numerous other questions which the audience would have liked to ask, the time schedule required adjournment of the panel session at this point.

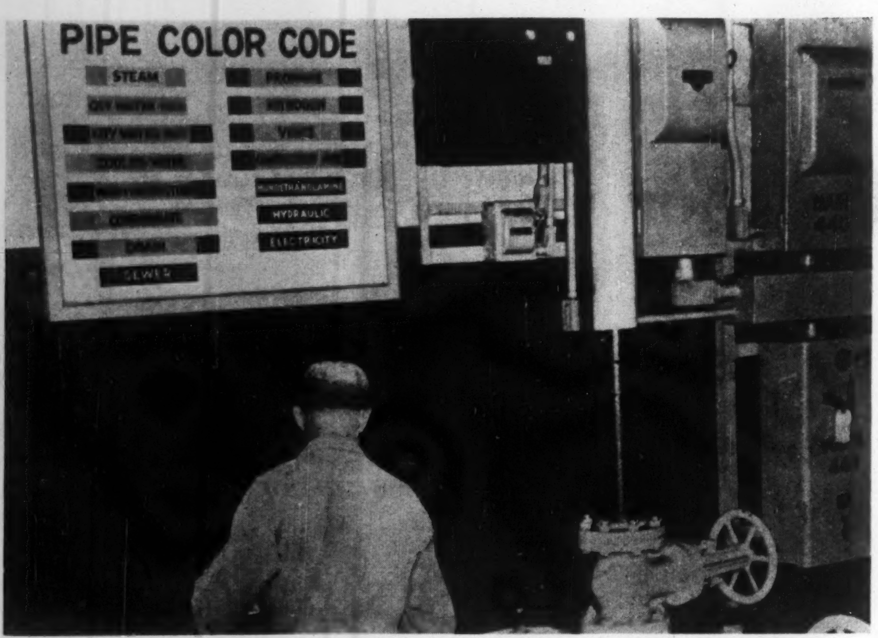
Municipal Building To Be Air Conditioned

. . . including the lock-up

AMERICA'S MOST comfortable prisoners this summer will probably be the inmates of the Olney, Ill., city jail. They'll be cooler in the cooler.

Contracts have been placed for air conditioning the new municipal building, which will house the mayor's office, police department, court room, waterworks department and a lock-up consisting of three cells.

The one story brick building will be heated in winter and cooled in summer by a 5 ton gas operated air conditioner, according to officials of Servel Inc.



THE PIPE COLOR CODE BOARD shown here is one of the reasons why there has never been an accident due to mistaken identification of pipe lines or valves in eight years of operation in the plant where bronze rod, tubes and shapes are produced in a continuous casting process

Piping Service	Color Code	Piping Service	Color Code
Steam	Orange	Propane	Yellow with Red Stripe
City Water, Cold	Green	Nitrogen	Yellow with Green Stripe
City Water, Hot	Green with Blue Stripe	Vents	Yellow with Black Stripe
Cooling Water	Green with Yellow Stripe	Compressed Air	Yellow with Blue Stripe
Warm Water Return	Green with Brown Stripe	Monoethanolamine	Blue
Condensate	Green with Orange Stripe	Hydraulic	Purple
Drain	Green with Black Stripe	Electricity	Black
Sewer	Brown		

Plant's Piping Color Code

. . . . . *Guards Against Accidents*

THERE HAS NEVER been an accident attributable to mistaken identification of pipe lines or valves in eight years of operation at the continuous-cast products department of the American Smelting and Refining Co. in Barber, N. J. This is an unusual record in view of the fact that there are 15 different pipe lines coursing through the plant.

This safety record is attributed to a pipe color coding system keyed to an easily understandable and highly visible code board which assures positive identification of lines. Each of the 15 pipe lines is painted a distinguishing color or combination of colors. These colors are reproduced in panels on the code board.

The board lists, and identifies by color, the steam, cold city water, hot city water, cooling water, warm water returned, condensate, drain, sewer, propane, nitrogen, vents, compressed air, monoethanolamine, hydraulic and electric piping services required to service the patented process for continuous casting of bronze rod, tubes and shapes.

Predominant color for air or gas piping is yellow, while green is the predominant color for pipes carrying liquids. At 30 to 40 ft intervals, the predominant color is banded with bright stripes of red, green, black, blue and other colors according to the function of the pipe. The color of the lettering contrasts with the color of the panel. On dark colored backgrounds, white lettering is used while black lettering is used on light colored backgrounds.

The pipe code system, used throughout the entire plant for some time, has been fully exploited in the continuous-cast products department. Besides preventing accidents, the system has greatly simplified maintenance work. Since it is very easy to trace lines without referring to blueprints, delays are avoided.

"Conditioning" Air For Health and Safety

By Allen D. Brandt
Chief Industrial Hygiene Engineer
Bethlehem Steel Co.

How To Prevent Air Contamination Discussed at AIHA Meeting

PREVENTION OF AIR contamination or pollution in its broadest sense was discussed at most of the session meetings of the annual convention of the American Industrial Hygiene Association, which was held in Chicago this year.

As in the past, the AIHA met jointly with four allied organizations — the American Conference of Governmental Industrial Hygienists, the Industrial Medical Association, the American Association of Industrial Nurses and the American Association of Industrial Dentists. Three days were devoted to AIHA meetings.

Even though these organizations meet jointly, each is individually responsible for its own separate program, with the result that many concurrent sessions are in progress continuously. Over 2000 persons attended the conference.

Following the precedent established previously, the AIHA again resorted to concurrent sessions in order to cover all aspects of the subject matter it encompasses in the short time available. Since the AIHA is concerned primarily with controlling those factors of, or transmitted through, the air which if uncontrolled may produce discomfort, injury or disease, many of the papers given are of interest to heating, ventilating and air conditioning engineers.

Threshold Limits Discussed

The AIHA's first technical session was devoted to a discussion of threshold limits for air contaminants. Since such limits constitute the very basis on which industrial ventilation systems for air sanitation should be designed, they are of vital interest to the industrial ventilating engineer. Allan Coleman presented a paper on the limits for solvent vapors, Theodore Hatch spoke on the limits for dusts, H. E. Stokinger described the limits for gases and Herbert J. Weber discussed the threshold limits for metal fumes.

Air Cleaning, Dust Collection

The various aspects of cleaning air before discharging it to the outside were discussed at the session on engineering. F. A. Thomas, Jr. described several fog type scrubbers that may be used to clean the air removed by process ventilating systems before it is discharged to the outside. M. W. First discussed the operating characteristics of wet fiber type dust collectors, and he pointed out that very porous beds of under 100 micron diam fibers permit high gas rates without flooding or channeling and provide large areas of wetted surface — per unit volume — for rapid gas absorption. He explained that the use of neutralizing or reacting scrubbing solutions permits high absorption capacity without buildup of an appreciable equilibrium back pressure. Substantial reductions in equipment size can be secured in this way, and for the treatment of obnoxious trace gases — as in atmospheric pollution control — the cost of fresh solvent is not excessive. He also reported on the collecting efficiency of such equipment as found in field studies of the equipment.

Jack Bailiff showed what can be accomplished in the way of dust suppression by water sprays at rock crushing and handling operations. H. F. Schulte discussed laboratory fume hoods — the ventilation rate required to accomplish adequate control. H. I. Miller outlined briefly how dust control was integrated with the construction of a large uranium ore and concentrates refining plant. W. C. L. Hemeon showed how the exhaust rates of ventilating systems for dust control at bulk materials handling equipment may be calculated from theoretical considerations.

At the second engineering session, J. J. Fitzgerald presented a paper dealing with the collecting efficiency of certain air cleaning filters and of filter media frequently employed in sampling the air for particulate contaminants. W. B. Harris discussed and illustrated the exhaust systems for dust control engineered into a beryllium production plant. George Hama presented a paper showing how effective a new surface active agent is in controlling the mist that normally escapes from the surface of chrome plating tanks. This new product is said to be expensive, but it reportedly saves money in operating costs by decreasing the loss of chromic acid and by eliminating the need for local exhaust ventilation at chrome plating tanks. Also, it is said that it reduces the exhaust rate required to accomplish effective control.

Atomic Radiation

As atomic energy applications grow, and contact in one way or another with the raw materials and end products of the atomic energy program become more common, industrial ventilating engineers and other engineers in the fields of heating, ventilating and air conditioning are searching for information on those facets of the subject which they are bound to encounter sooner or later. This was evident at the several radiation sessions that were conducted at this conference. S. J. Harris spoke on radon concentrations in certain mines in New York State. E. E. Morrill, Jr. discussed radioactive dust and gas in uranium mines in Utah. Herman Cember presented a paper dealing with radioactive particles in the lungs. Papers on the toxicity of polonium and of radon were presented by F. A. Smith and D. A. Morken, respectively. Simon Shlaer discussed a method for measuring thoron in the air.

On the subject of air pollution, several interesting papers were given. A. E. Hitchcock discussed the effect of certain industrial gases on plant life — especially hydrofluoric acid. Some of the gases which may be discharged to the outside by process ventilating systems are capable of damaging sensitive plants in very low concentrations. J. Cholak gave a paper dealing with air pollution from a blast furnace slag processing plant.

The titles and authors of the papers mentioned herein are:

Threshold Limits —

Solvent Vapors — Allan Coleman, Bureau of Industrial Hygiene, Connecticut State Department of Health, Hartford.

Dusts — Theodore Hatch, Department of Occupational Health, Graduate School of Public Health, University of Pittsburgh, Pittsburgh.

Gases — H. E. Stokinger, Ph.D., Occupational Health Field Headquarters, U. S. Public Health Service, Cincinnati.

Metal Fumes — Herbert J. Weber, Industrial Hygiene Department, American Brake Shoe Co., Chicago.

Fog Type Scrubbers — C. R. Kernan, Jr., Monsanto Chemical Company, Anniston, Ala., Ben F. Brian, Lieutenant, USAF, Wright-Patterson Air Force Base, Dayton, Ohio, Duncan G. Hudson, Saran Lined Pipe Co., Ferndale, Mich., and F. A. Thomas, Jr., School of Mechanical Engineering, Georgia Institute of Technology, Atlanta.

Field Evaluation of Wet Fiber Filters for Treatment of Air Contaminants — M. W. First, Sc.D., Consulting and Research Engineer, Newton Centre, Mass. and R. P. Warren, Buffalo Forge Co., Buffalo.

Water Sprays as a Means of Dust Control in Rock Crushing — Jack Bailiff, Division of Industrial Hygiene, New York State Department of Labor, New York.

Evaluation of Laboratory Fume Hoods — H. F. Schulte, E. C. Hyatt, H. S. Jordan, and R. N. Mitchell, Industrial Hygiene Group, Los Alamos Scientific Laboratory, Los Alamos, N. M.

Ventilation and Dust Control in Refining Uranium Ore and Concentrates — Herbert I. Miller, Jr., Catalytic Construction Co., Philadelphia.

Theoretically Required Exhaust Rates for Dust Control in Bulk Material Handling Systems — W. C. L. Hemeon, Industrial Hygiene Foundation, Pittsburgh.

Collection Efficiency Studies of Air Cleaning and Air Sampling Filter Media — J. J. Fitzgerald and C. G. Detwiler, Knolls Atomic Power Laboratory, General Electric Co., Schenectady, N. Y.

Engineering Controls in a Beryllium Production Plant — A. J. Breslin and W. B. Harris, U. S. Atomic Energy Commission, New York Operations Office, New York.

Absolute Control of Chromic Acid Mist from Electroplating by a New Type of Surface Active Agent — George Hama, William G. Fredrick, Sc.D., Detroit Department of Health, and Henry Brown, Ph.D., Udylite Corp., Detroit.

Radon Levels Found in Mines of New York State — Saul J. Harris, Division of Industrial Hygiene, New York State Department of Labor, New York.

Radioactive Dust and Gas in the Uranium Mines of Utah — E. Elbridge Morrill, Jr., Division of Occupational Health, Utah State Department of Health, Salt Lake City.

Lung Hazards from Radioactive Particles — Herman Cember, Graduate School of Public Health, University of Pittsburgh, Pittsburgh.

Investigations into the Toxicity of Polonium: Effects of Routes of Administration — F. A. Smith, Ph.D., P. E. Morrow, L. J. Casarett, R. Della Rose and J. N. Stannard, School of Medicine and Dentistry, The University of Rochester, Rochester, N. Y.

The Acute Toxicity of Inhaled Radon — Donald A. Morken, School of Medicine and Dentistry, The University of Rochester, Rochester, N. Y.

A Method for Measuring Thoron in Air — Simon Shlaer and George M. Angleton, Los Alamos Scientific Laboratory, Los Alamos, N. M.

The Effect of Industrial Gases on Plants with Special Reference to Hydrofluoric Acid Gas — A. E. Hitchcock, Ph.D., Boyce Thompson Institute for Plant Research, Inc., Yonkers, N. Y.

Air Pollution in an Area Adjacent to a Plant Processing Iron Blast-Furnace Slag — J. Cholak, L. J. Schafer and D. Yeager, Kettering Laboratory, College of Medicine, University of Cincinnati, Cincinnati.

The Use of Maskng Agents and Odor Reactants in Controlling Industrial Odor Problems — W. A. Quebedeaux, Jr., Ph.D., Stream and Air Pollution Control Section, Harris County Health Unit, Houston.

Controlling Industrial Odor

W. A. Quebedeaux, Jr. spoke on masking agents and odor reactants as the solution to certain odor problems to which no other satisfactory solution is known. He said in every industrial odor problem there are several similar characteristics found. These conditions include the quantity of odor present in trace amounts, different reactions between individuals to the odor, cost for equipment to remove the trace elements, and a large portion of the odor produced being regulated by plant housekeeping. No problem can be completely solved unless adequate consideration is given these different phases of the problem.

In order to abate an industrial odor, the following steps should be taken:

a) A thorough study of the particular plant conditions.

b) Plan to remove particulate matter from the stack.

c) Plan to remove those gaseous materials which are irritant.

d) Use either a masking agent or an odor reactant to remove the offensive nature of the odor traces.

e) Determine experimentally both the proper amounts to use and the best locations for the control equipment.

f) Constant vigilance is required to assure that odor accumulations within the plant are either minimized or completely removed.

He concluded by stating that masking agents and odor reactants are coming into general use in our everyday life. As more work is done in the field of odors, the masking agent and the odor reactant will become indispensable to our way of life.

The next annual meeting of the AIHA will be held in Buffalo, in the latter part of April 1955.

Air Conditioned Offices Reduce Absenteeism

. . . in New York

In 1952, 61.8 percent of New York City's offices reported that they closed early at least one day because of the heat. Also, there was a noticeable drop in productivity according to the American Institute of Management. Air conditioned offices reported under average absenteeism during heat waves. The office apparently was more comfortable than the non air conditioned home, and thus, workers were so attracted.

How Good Piping Practices Pay

. . . plant operations forum told

At a small laundry making a net profit of but $7000 a year, steam traps blowing through were wasting $1000 worth of steam annually, according to Richard K. Lee, of the Armstrong Machine Works, in a talk on "trapping for profit" at a recent plant operations forum. "If the laundry had had a few more traps not operating properly, there wouldn't have been any profit at all—and the laundry would have been working only for the benefit of its fuel supplier," he pointed out. His figures were based on a steam cost of $1.50 per 1000 lb.

Mr. Lee spoke at a session on piping and steam generation of a plant operations forum for macaroni and noodle manufacturers sponsored by the Glenn G. Hoskins Co., industrial consultants.

Trapping for Profit

In another example he cited, jacketed steam kettles for cooking caramel for making candy required 80 minutes per batch, although the kettle manufacturer had said 60 minutes would be needed. By replacing two old steam traps in poor condition with new and properly sized ones, the cooking time was cut to 50 minutes. This of course increased production without increasing costs, and thus increased profits.

At yet another plant, it was found that a large number of old traps installed in the 1920's were blowing steam, representing a large waste. On inspection, it was found that the trap interiors had been completely destroyed by corrosion. Instead of traps, therefore, there were nothing but "orifices" in these steam lines. New traps were installed, and large quantities of steam were saved.

Mr. Lee told his audience to:

1) Be sure a good trap is used.

2) Be sure that every place in the plant that needs a trap has one.

3) Be sure the traps are kept in good operating condition.

In this way, "trapping can be profitable," he concluded.

Practical Piping Pointers

At this session, E. G. Habenicht of the Crane Co., showed a movie film of practical piping pointers, giving helpful hints on the application and maintenance of piping equipment. The film explained many types of valves, fittings and piping accessories, showed proper methods of installation and maintenance, and wound up with such suggestions as:

1) Locate valves for convenient operation and for valve safety. It should be easy to reach the handwheel. Valves should be installed so they are not subject to possible damaging blows from a plant truck or other such hazard.

2) Give valves plenty of headroom. If lack of clearance prevents full opening of a valve, excessive pressure drop, disc vibration, and quick wear of valve seats will occur.

3) Identify the pipe lines. The functions of every line should be known so that valves can be operated quickly and properly in case of emergencies. Pipe lines can be identified by tags, plates or painted color codes.

4) Water hammer in pipe lines does serious damage. In steam lines, condensate or slugs of water can rupture joints, valves or fittings and can loosen anchors and supports. This hazard can be eliminated by adequate drainage, using steam traps when applicable. Sudden stoppage of flow in liquid lines can cause water hammer. Adequate air chambers or other cushioning devices should be installed ahead of quick opening valves.

Plant Heating

Samuel R. Lewis, consulting engineer and a member of HPAC's board of consulting and contributing editors, spoke on plant heating—particularly the use of hot water systems. He mentioned one amusing incident at a steel plant, where make-up water for the heating system suddenly became excessive. On investigation, it was found that one of the foremen (who had a key) was making a practice each Sunday of bringing his car to the plant to wash it—using hot water from the heating system for this purpose.

A number of questions were asked by the audience. In answering them, Mr. Lewis stressed that No. 5 oil should not be burned without preheating, and that condensate from oil preheaters should not be saved. It is better, he said, to waste it to the sewer, as a leak which would allow oil to get into the condensate could cause a lot of trouble.

He said — in answering another question — that individual steam traps should be used on heating coils in dryers to prevent short-circuiting and consequent air-binding. He stressed also the importance of eliminating air from piping, as it is a prime cause of corrosion in return lines and also creates air-binding difficulties in supply lines.

One plant man mentioned difficulties he has been having during the last four months with corrosion because of the sulphur content of the fuel oil he is burning, he believed. There is also scale on the boiler tube sheet. Mr. Lewis' advice was to buy fuel from a different supplier.

In addition to the session on piping and steam generation, the two-day forum featured several other sessions on problems peculiar to the macaroni industry.

ASRE Celebrates 50th Anniversary

• This month the ASRE commemorates the 50th anniversary of its founding at its semi-annual meeting in Seattle. Mr. Hess has reviewed here briefly the events that took place prior to and after the founding in 1904 and has cited the rapid growth of the refrigeration industry since that time.

By Arthur J. Hess
President, Hess, Greiner & Polland and ASRE President

A RAPID GROWTH has been experienced by the American Society of Refrigerating Engineers in the 50 years since it was organized, and as might be expected, this growth has paralleled very closely the growth of the refrigeration industry itself.

I well recall as a youth that the only refrigeration in the Los Angeles area consisted of an ice plant for an express company in transporting fruit, and another ice plant in a large brewery. I recall with what fascination we used to watch the large flywheel turn slowly to produce the refrigeration for cooling the brew. Possibly the fascination for this project was influenced by the fact that it was on forbidden territory because my parents were of the opinion that the "sin producing" alcohol might infect myself and my brothers. However, since that time, things have changed, and the refrigeration industry has become a large industry, and the ASRE has grown correspondingly.

ASRE Founded in 1904

The formation of the ASRE started on a day in December 1904 with a meeting of less than 40 mechanical engineers that were all interested in refrigeration. The society has maintained a steady, consistent growth, and this year celebrates the 50th anniversary of its founding. The society has over 6,000 members who live in practically every state, possession and territory of the U. S., and in 64 foreign countries. According to one of the early past presidents, who was present at the initial meeting, most of the engineers of those days whose principal interest was in refrigeration problems were members of the ASME, but there was little of interest in the ASME for them, although some outstanding papers on the subject of refrigeration had been presented from time to time. Therefore, this group of engineers, which had been getting together in a huddle for discussions of their mutual problems, found the time ripe for founding a society of refrigeration engineers which became the ASRE.

The first president was John E. Starr, at that time a successful and well known consulting engineer who, in his opening address, stressed the need for such a society and predicted not only a rapid growth but a great future for the refrigeration industry and the society. Even though he possessed a prophetic viewpoint, little did he visualize the tremendous impact that refrigeration was to have on our everyday life. Equally prominent in the organization of the society was another man with vision, William H. Ross, who became the first secretary, continuing in this position for nearly a quarter of a century. Mr. Ross was appointed secretary, subject to the pleasure of the council, at a salary of $25 a month, out of which all the expenses of the society were to be paid.

It is of interest to note that at the time the ASRE was organized, the principal applications of refrigeration engineering were confined to ice making, cold storage plants, meat packing, dairy products and breweries, though the need for refrigeration in many other industries could be felt even then.

A review of the early transactions of the society and interviews with some of the old timers still living who participated therein indicates that the discussions were "fast and furious" with no holds barred, often becoming quite personal. Doubtless the present day formula for beginning a discussion of a technical paper with the words, "The author is to be highly complimented on his paper, but" was used, except that what followed the "but" in those days was frequently a vigorous dispute of the author's claims in no uncertain language, much to the edification and enjoyment of those present. Once the organization was perfected, regular meetings were held annually and later semi-annually, where technical papers are presented dealing with various phases of the rapidly advancing art.

Local Sections Give Strength

One of the bulwarks of strength of the society since its early days has been the local organizations which are known as "Sections," four of which were organized in 1917-18. Since then they have increased in number steadily until there are now 35 sections, including two in Canada. These local groups are financially sustained wholly by subsidies from headquarters, though a movement is now on foot to permit the local sections to charge dues, supplemented by a small contribution from the national treasury.

Local sections are in reality the life blood of the society and frequently act as training grounds for national officer and committee material that can be developed for the betterment of the society. Sections hold monthly meetings where technical papers, often of particular local interest, are presented and supplemented by at least one social session during the year.

Many Committees, Activities

With the exception of a small paid staff at the headquarters, all of the work is done on a voluntary basis through some 60 miscellaneous committees of over 250 members, many of them working in cooperation with similar committees from other technical and trade associations. The major portion of the technical work of the ASRE is accomplished through the 25 technical committees, the personnel of which is assigned to various phases of refrigeration work for which its members are particularly well qualified. The headquarters are in New York City, and the latch string is always out to ASRE members and friends.

One of the most important but perhaps less spectacular functions of the society is the preparation and adoption of standards for testing and rating refrigeration equipment. This society function is the responsibility of the ASRE standards committee which is charged with the selection, development and preparation of all codes, recommended practices and standards in the field of refrigerating engineering. The standards committee also cooperates with other national organizations toward this same end. These codes and standards, after completion, are submitted to the ASRE council and membership for adoption. The development of a standard often covers a period of several years and there are countless hours of labor contributed by loyal members.

One of the most popular and best known standards is the ASRE sponsored B9 Safety Code for mechanical refrigeration installations, a code of the American Standards Association which is widely used in whole or part by municipalities throughout the country. It has just been revised, after many sessions of the ASRE committees.

Publications Progress, Too

The ASRE is probably best known to the industry through its regular publications, which comprise *Refrigerating Engineering, Air Conditioning and Refrigerating Data Book* and *Refrigeration Abstracts.*

Refrigerating Engineering is a monthly magazine which is distributed to all ASRE members. It contains articles on a variety of topics — from portable air conditioning units for airplanes to processing and handling quick frozen orange juice. The magazine also publishes articles on new applications in the fields of industry, food processing, transportation and human comfort. Authoritative articles of these types are balanced carefully between commercial, industrial and household refrigeration, air conditioning, the refrigeration of foods, locker storage, basic research and theory. Book reviews, trade news, new equipment and items describing the meeting activities of the various local sections are also included. Standards are first printed in the magazine before being offered for sale to the industry.

Air Conditioning and Refrigerating Data Book, of which there are two volumes, is the recognized handbook of the refrigeration engineering profession. Comprised of over 1500 pages in substantially bound volumes, the Data Book contains a vast amount of fundamental information as well as practical working data.

The Design Volume deals with fundamentals and the broader aspects of application, including the theoretical explanation of the principles of refrigeration and air conditioning with unique analyses, examples, problems and their solutions. One of the most valuable portions of this book is the complete series of tables and charts giving the properties of refrigerants based on temperatures as low as minus 100 F.

The Applications Volume consists of 65 chapters, each one devoted to a specific application or closely allied subject, written by engineers of wide experience in their respective fields. In the discussion of each application, fundamental principles are first explained, followed by a description of the process employed. These applications range from bakeries, breweries and butter making to stratospheres, skating and wine making.

THE AUTHOR, Arthur J. Hess, is the national president of the American Society of Refrigerating Engineers. He is also active in the American Society of Heating and Ventilating Engineers, and is a member of the ASHVE's council

A useful feature of both volumes is the classified section which includes a comprehensive list of refrigeration equipment products and their manufacturers. The list has been subdivided and cross indexed so as to facilitate the location of a company making any particular product. Membership dues to the ASRE include the cost of the two volume publication, as published periodically.

Refrigeration Abstracts, the youngest member of the family of ASRE publications, is rapidly winning a name for itself. A five issue per year journal, it is published in response to the continually increasing number of inquiries received for technical information on refrigeration subjects. It provides a reference source of all possible published articles on refrigeration and air conditioning. At the present time, several hundred periodicals in the refrigeration field are being reviewed, and eventually this effective abstract service will provide a coverage of the literature of the entire world on this subject. While this publication is largely used by design and research engineers, many salesmen find therein a wealth of information on unusual and little known refrigeration applications.

PRACTICAL PIPING PROBLEMS

Correcting Water Hammer

. . . in a plant

By Bill Dopp

• Bill Dopp has had some 40 years of experience dealing with piping, including a long stretch of service as a sales engineer. He is devoting part of his present leisure to drawing on his many piping experiences.

This month, Mr. Dopp's principal character, Martin MacVane, helps some of his friends at a processing plant to clear up a problem involving water hammer in the piping which was causing valves to be ruptured.

MAC had just dropped in at the small processing plant for a visit with his friend Dick Wilson, the superintendent, whom he had not seen for a long time. They were discussing old times when a young man with a puzzled expression walked into the office. He carried a small valve in his hand that seemed to be broken into two pieces. "Here's another one," he exclaimed before he noticed Mac. "Pardon me," he said, starting to back out.

"Come on in, Bill," invited Dick. "This is Martin MacVane, an old friend of mine. Maybe he can tell us what's wrong with those valves." He grinned at Mac, saying, "Meet Bill Anderson, Mac. He's been appointed chief engineer of the plant since you were last here."

How Did Globe Valve Break?

"Happy to make your acquaintance," declared Mac, shaking the young man's hand. He sized up the lean intelligent face, noted the alert gray eyes and nodded approval. Glancing at the rugged hands, he asked, "How did you break that globe valve?"

"I wish I knew," answered Bill. "This is the fourth one we have wrecked in the last few weeks. I understand that they have been having the same trouble for a long time. I can't figure out what's doing it. I thought at first it was water hammer, but it can't be. This valve was on the third floor. When the operator on the second floor opened a similar valve, this one goes pop and it is blown wide open with steam and water all over the place." He paused, frowning at the valve. "If there were any water hammer, you would hear it, but this thing just goes pop without any particular noise or rattle. It's got me."

"It Must Be Water Hammer"

"It's water hammer, all right," declared Mac. "What does the layout look like?"

"You're wrong this time, Mac," laughed Dick. "There can't be any water hammer in that setup. It's self draining. Besides, as Bill says, if there were, you would hear it all over the place."

"You may be right, Dick," observed Mac, "but I've seen a whole plant shut down with one blow of moving water that opened up a steel tee as if it were made of paper. Never underestimate the power of water in motion." Mac paused to give his words emphasis, "And remember that there are many things that can get it moving."

While they were talking, Bill made a rough sketch of the piping layout. "Here's the way this piping goes," he said, as he laid it before Mac. "This is the main riser. It comes directly off the top of the header in the basement. There is a two and a half inch gate on the header. We keep this valve partly open so that the line can drain back into the header. The steam from this piping is used only for sterilizing, so that we are drawing on it only a small part of the time. At each of the three lower floors there is a cross, and on the fourth floor a tee taking one inch branches on each side to the mixers. Every one of these branches has a one inch iron body globe valve about fifteen feet from the riser. All of these valves are tight; I can swear to that. I have them all in with the pressure on top of the disc, and there is no leakage into the mixers. That's the setup."

"What Happened?"

Bill had talked slowly and earnestly to be sure that Mac got a clear idea of the layout. He frowned several times as he glanced at Mac and detected an amused grin. His answer was prompt when Mac asked, "What happened?"

"When the operator on the second floor opened his valve this morning, the steam had hardly got going when a fellow on the third floor came dashing down yelling that the third floor valve had let go. They telephoned the basement, got the steam shut off, and then reported to me. Here is the valve. The third floor man says

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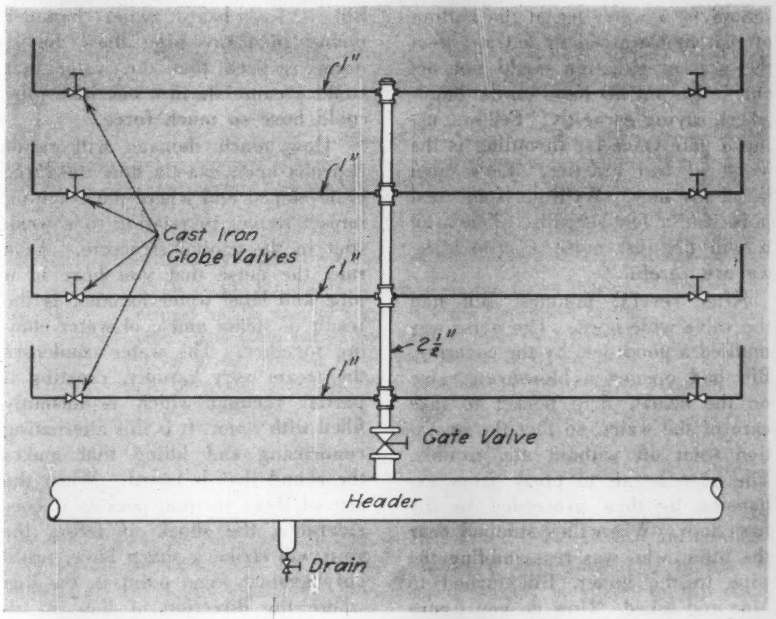
All of the names in this article are fictitious.



1 "SINCE YOU ARE USING that valve in a throttling position, it really should be a globe valve. Using a gate valve for throttling is the worst of bad practice."

that there was just a kind of loud pop. I asked about that water hammer but the people around the spot bear out the operator. They all say that there was none."

"I suppose that all of the other valves were closed?" asked Mac.

"Yes — I imagine that they were, although I don't know for sure. We probably would have heard from some one when the steam was shut off if they had been using it."

"Have you turned on the steam again?" inquired Mac.

"No, not yet. The maintenance crew is just about through putting in the new valve. I'll go up and see."

"I'll go with you, if Dick doesn't mind. I'd like to see that self draining system." Mac eyed Dick amusingly as they left the office.

A check of the situation proved that the new valve had been installed, but that nothing had been done about restoring the line to service. Mac led them back to the first floor, saying to Bill as they arrived, "Can we swing one of these lines, so that we can see what comes out of it and can take care of any water that might show up?"

"Sure we can," declared Bill, as he turned to a fitter to give him directions. "What are you going to do?" he asked Mac.

Like One Pipe Steam System

Mac failed to answer the question. Instead, he watched the fitter connect the pipe so that it had an open end over a drain in the floor. Then holding up the sketch that he still had in his hand, he pointed to the end of the fourth floor line. "If I see this thing right, then this system works exactly like a single pipe steam radiator system. As the radiators get cold, the steam condenses and water accumulates in the bottom of the radiator. Each of these has an air valve that will open as the radiator cools. If one of these valves fails to open, the receding water will create a vacuum in the top of the radiator causing the water to hang there just as it does in a bottle when you suddenly turn it over and prevent air from entering it. I suspect that every one of these horizontal lines is partly filled with water. Let's find out." He turned to Bill. "Please have some one open both the valves on the three upper floors, starting at the top. When that is done, air will flow back into the lines and we should get a flood of water from this line here."

Mac opened the globe valve as Bill gave the order. Water flowed freely from the pipe for a few moments, but soon it slowed up. Suddenly, it spurted out again, continuing to flow a full stream for some time. They could tell by the way it spurted whenever one of the valves on an upper floor was opened. Finally, Dick remarked, "I guess that there was some water hanging in those lines all right, but that doesn't prove that water hammer had anything to do with breaking that valve."

"Where's the Header?"

"Before we go into that, let's go down to the basement. How far is it down to that header, Mr. Anderson?" Mac asked.

"About seven feet, I should say, from the header to this pipe. You're thinking of the water that's lying on top of that gate valve. So am I. That self draining feature doesn't look so good now, Dick," he laughed. After a moment Dick joined in.

"Guess you are right. Just how do we get rid of it, Mac?" he asked, turning a puzzled look on the gasket salesman. "Looks as though we could stand some improvement around here, doesn't it, Bill?"

"First, we close this valve and then get those on the second and third floors closed. You'll have to station someone on the fourth floor to watch the valves there so they will be closed when dry steam gets to that point. By the way, how much pressure do you carry on this system?" Mac inquired of Bill.

"This line has only ninety pounds on it," the young man answered, "but I'm worried about that seven feet of water. I'd hate to dump that into that header suddenly."

Use Globe Valve to Throttle

"There won't be any need of that," declared Mac. "We'll take a chance on that gate valve. By cracking it open against an open system, the seven foot head is all that we will be concerned with. The water will work through part of the opening by gravity while steam flows past through the balance of the space." They were in the basement now. Mac pointed to the valve in question. "Since you are using that valve in a throttling position, it should really be a globe valve. It should feed steam into the side of the line. There should be a water leg at the bottom of that line drained by a trap; then the present situation could not occur." He put his hand on the handwheel, saying earnestly, "Fellows, using a gate valve for throttling is the worst of bad practice. Let's open this baby now. We'll get some real noise for a few seconds. That's all it will be, just noise — providing we are careful.'"

After several minutes, Bill had the valve wide open. The noise was muffled a good deal by the covering. Bill had opened a blowdown valve on the header drip pocket to take care of the water, so that the operation went off without any trouble. The pipe began to creak from expansion as they proceeded to the first floor. When they stopped near the fitter, who was reassembling the pipe to the mixer, Bill turned to Mac and asked, "How do you figure that water hammer could have broken that valve? Admitting that water did hang in the horizontal pipe, what started the water in motion so that it caused the break?"

Valve Failure Explained

"The entire system was static and under ninety pounds pressure," answered Mac. "The horizontal line was partly full of water that was held up against the valve by the pressure in the system. When your man opened the valve on the second floor, he suddenly lowered the pressure in the system, causing the water to pull away from the valves, and thus created a partial vacuum at that point. This was only momentary, however. The pressure in the line quickly restored the balance, drawing from the partly open gate valve. Then the water in the branch rushed back to fill the vacuum that gravity and the lowered pressure had created. The impact of stopping that motion was what ruptured the valve. Had that been a brass valve, it probably would have taken the blow so that a loud thump would have been the worst effect that would have occurred. But cast iron can't take a sharp blow like that. So the valve went. Had there been a cast iron ell ahead of the valve, the ell would have gone instead."

"It doesn't seem possible that the impact of that water could be sudden enough to do this damage," said Bill. "I've heard water hammer pound in many pipe lines, but I never realized that the water that could accumulate in a one inch pipe could have so much force."

"How much damage will result depends upon exactly how the force is developed and where the resulting impact strikes in relation to a weak spot in the piping structure. As a rule, the noise that you hear in a pipe and label water hammer is the result of steam and cool water coming together. The water condenses the steam very rapidly, creating a partial vacuum which is instantly filled with water. It is this alternating condensing and filling that makes the sound that is heard. When the size of these vacuum pockets is considerable, the shock of filling the void will strike a sharp blow, probably against some point in the line where the direction of flow is diverted, sometimes causing it to jar severely or even to rupture." Mac smiled wryly as he finished his little lecture.

"Just how does that apply here?" asked the superintendent.

"The void probably occurred inside the valve body," answered Mac. "That meant that when the water refilled the space, the blow struck the bridge wall of the valve. Cast iron being fairly rigid, as well as somewhat brittle, could not resist the shock. The contour of the body has something to do with that, too. Where there are sharp turns in the structure, sudden impact becomes doubly effective. It must be realized also, that this blow was struck from inside the body. What the magnitude of it was, no one will ever know. It's much higher than you suspect though. I've seen attempts made to measure these shocks with gages that wound up with nothing but wrecked gages."

"How are we going to avoid having this happen again?" asked Bill. "I certainly will change the piping at the header as you suggest, but that does not solve the problem of these particular valves. What's the answer here?"

Pitch Horizontal Lines

"The simplest way to avoid this same trouble is to change those horizontal lines so that they have a decided pitch back to the main riser. If they were much longer, I'd suggest draining each one from the other end. However, in view of the little use they actually get and the relatively short distance of fifteen feet involved, I think that if you give them a backward pitch of a couple of inches you would have no more trouble. These globe valves should be kept open, though, until the system has reached its working temperature. I would replace any of them that gave any trouble or that leaked with brass valves. They can really take more abuse than the iron body valves."

"Mac, I'm still puzzled about this matter of water hammer," declared Dick. "You say that it is usually caused by condensing steam. Well, how about a long straight line that is being warmed up. I recall an accident where the end of a long twelve inch line was blown apart. It had a tee connection on top and a blind flange on the end with a two inch drain in it. They had warmed the line up for several hours when they opened the main valve. Suddenly the whole thing began to shake and pound. The end of the pipe tore off, filling the tunnel with steam and water. It was just luck that no one was killed."

"That has happened many times, principally because people will not understand how much heat it takes to warm up a long pipe line. You are dependent upon the latent heat of the steam for the rapid warming of the pipe walls. As this heat is released to the pipe, the steam condenses and the water lays in the bottom of the pipe. However, steam can no longer reach the pipe wall that is covered by the water so that the heating process is materially slowed down. You said they were draining this twelve inch pipe with a two inch drain on the far end. The steam condensed much faster than this pipe could carry off the water so that pipe was probably nearly half full of water when the valve was opened."

"Waves" Cause Water Hammer

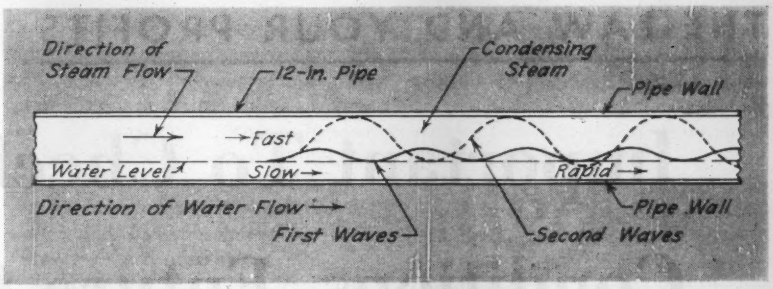
Mac stopped to draw a sketch on the back of the paper he was still holding. "Look here. In your case, while the warming valve was all that supplied steam to the pipe, there were only ripples on the surface of the water lying in the bottom of the pipe. When that big valve was opened, steam rushed into the pipe at high speed, continuing to flow until the entire pipe had reached a stable pressure. Did you ever see the wind start to make waves on the lake?"

"Yes," replied Dick and Bill together.

"Well, that's exactly what happened in that pipe. The rush of steam created waves. The waves soon got so high that they closed off pockets of steam between them. The water, being cool, condensed this steam, creating partial vacuums that the water tried to fill — which increased the velocity. Who can guess how fast it was going by the time it got to that blind flange? Like waves hitting a breakwall, the water surged back, only to meet the following waves racing toward the end. This surge created a vacuum in the end of the pipe beyond the tee connection. The onrushing water instantly filled this space with terrific force. Blow after blow made the destruction of the pipe inevitable. This can happen in an air line containing water, too."

"Jumping Jupiter," exclaimed Bill. "I never heard the effect of water hammer explained that way before. I can see how it works, though. I've watched the waves on the lake shore many times and wondered how one could calculate the force with which they strike the rocks but I'd never thought of waves in a pipe line. That is a new one to me."

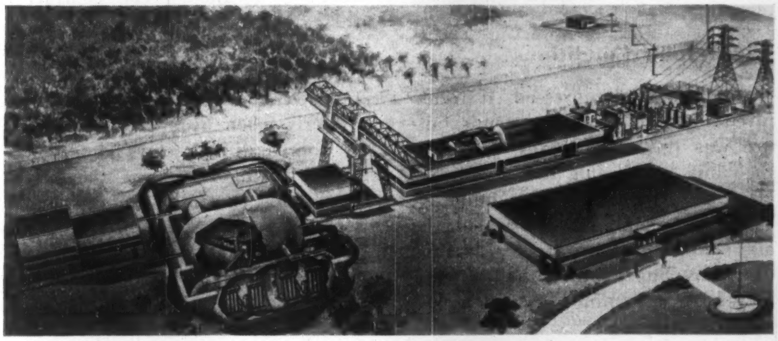
"Nature always obeys her own laws," declared Mac. "Whenever air or gas moves across the surface of a liquid it produces a surface friction that causes the liquid to try to follow the moving air. This creates the waves. The more rapid the movement, the higher and larger they will become. Adding their own weight to the forward motion, they will strike any obstruction with tremendous force. If they are confined inside a pipe and the matter of condensation is added to the situation, the problem really becomes complex. The forces that are involved, if uncontrolled, can destroy anything." Mac handed the paper back to Bill. "As I said before, fellows, never underestimate the power of water in motion." He waved at them as he turned to leave and said, "Good-by and good luck."



2 WATER HAMMER is caused by the waves that are formed by the rush of steam over the condensate in the pipe. The water surges back only to meet the following waves toward the end of the pipe or the valve that stops the flow, and a terrific force is developed which often causes failure

Sketch Shows First Atom Power Plant

. . . 60,000 kw minimum



WATER UNDER pressure is to be pumped through the pressure vessel housing the reactor. It is heated and pumped to heat exchangers to produce steam which is piped to the turbo-generator

THE NATION'S first central station atomic power plant is to be built as a joint project of the Atomic Energy Commission and the Duquesne Light Co.

The plant components depicted in the artist's sketch are, from the left, a building for fuel handling, the atomic reactor and heat exchangers, the maintenance building and overhead traveling crane, the turbo-generator building, the switchyard containing transformers and circuit breakers, and transmission lines. In the right foreground is a building containing shop and administrative facilities.

The atomic reactor which provides the heat, and the heat exchangers which generate the steam, will be underground in concrete and steel structures to provide protection to operating personnel and the surrounding area in addition to the many protective devices in the reactor itself. The large central underground structure houses the reactor itself which is located within the vertical, cylindrical container representing the pressure vessel.

Water under pressure is pumped through this vessel, the Westinghouse Electric Corp. explains. It is heated and is pumped to the four heat exchangers. Heat from this pressurized superheated water converts other water in heat exchangers to steam. The steam then is piped to the turbo-generator. The plant will produce a minimum of 60,000 kw.

THE LAW AND YOUR PROFITS

Important To Check the Job Conditions, Future Operation

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. His former duties as a vice president of the Atlanta Trust Co. gave him a practical legal background.

EVERYONE wants to make a sale — but enthusiasm sometimes causes blind spots. Excitement at getting his prospect to "john-hancock" the dotted line caused our product-proud contractor in the following case to forget the importance of adequate power.

A merchandising firm — which we'll call Yardgood's — contracted with Debbon-Air, Inc. [also a fictitious name] to furnish and install an air conditioning unit for its place of business. In due course, a package conditioner was decided upon and put in. Yardgood's, having made a cash down payment, agreed to pay the remainder within a 60 day period.

That summer must have got off to a hot start. At all events, Yardgood's found the atmosphere in its establishment far from cool, despite strenuous efforts to make the conditioner's performance adequate. After a month of struggle, Yardgood's wrote Debbon-Air, demanding refund of the down payment and removal of the conditioning unit from the premises.

Debbon-Air took out the offending equipment and installed another unit in its place. Both parties were optimistic until the new equipment was put in operation. When it, too, failed to lower the temperature sufficiently, tempers flared and lawsuits were filed.

Debbon-Air led off by haling Yardgood's into court for non-payment of the promised balance. As a tactic of defense, Yardgood's demanded recovery of the sum already paid and refused meanwhile to surrender possession of the installed equipment.

Check Job's Conditions

As the trial progressed, it transpired that the cooling system's failure was due, not to any defect in the unit itself, but to insufficient electrical voltage in the building. This fact seemingly exonerated the air conditioning contractor. However, any hopes which that concern may have entertained were withered by the trial judge.

"This situation," the learned justice opined, "although it is not attributable to the seller [Debbon-Air] did not relieve him of liability.

"It is the court's decision that it was incumbent upon the seller, by whom the machine was installed, to ascertain before installation of the machine whether it would properly operate upon the electrical voltage furnished in the building.

"Evidence indicates that the seller did not do so, and that the machine did not have sufficient power to do the job.

"The buyer purchased the machine in reliance upon the seller's assurance that it would work properly" in his place of business. "Therefore, the implied warranty was for that particular purpose.

"It is clear that the machine failed to function properly; and therefore, the initial payment must be refunded to the purchaser."

Application of the principle here involved is not limited to matters of electrical voltage or amperage. It governs equally well such questions as water pressure, quality and supply; corrosive chemicals or other impurities in the outside atmosphere at the air intake; etc. — that is to say, any lack or condition respecting the *premises* wherein the equipment is to be installed. The contractor *warrants* not only that the subject equipment is free from defects and "reasonably adapted to the purpose intended", but that it *works* well and properly when installed. Therefore, all contributory factors in connection with the premises themselves have to be carefully examined and, if necessary, tested by the contractor before he undertakes the job.

Unskilled Operation Possible

Another contingency that should be weighed before undertaking a job is the *possibility of unskilled operation.* While not a major hazard respecting very large installations, it is present in those of lesser calibre — even though the occupancy may be industrial or, as in a recent case, institutional.

The Beulah Park church [the name is fictitious] had been equipped for heating with a conversion burner put in by a local contractor. As part of a general improvement and remodeling program, it was presumably ready for use as soon as the next cold snap should set in coincident with church services. This event shortly came to pass and three of the church members attempted to start the burner according to typewritten instructions furnished with the equipment.

The churchmen had been informed that upon opening a valve and closing a switch, the burner would start. They proceeded to follow the information, but nothing happened. They then read the "operating instructions," which were extremely complex and technical and comprised four letter-sized typewritten sheets. Among the 16 paragraphs, those headed "Initial Start-Up" and "Normal Starting Procedure" were designed for the use, respectively, of the *installer* and the subsequent *operator* (presumably trained).

The devout amateurs, intelligent but falling neither under the installer nor the trained operator category, chose the wrong paragraph. The results were tragic. A violent explosion killed one of the three churchmen, who, according to the court contention of the dead man's administratrix, was misled by the negligently worded instructions that accompanied the heating equipment.

A heavy verdict for damages was found against both manufacturer and installer, and the judgment was upheld on appeal. Such an outcome could have been avoided had the contractor weighed the possibility of subskillful operation.

[Note: While this discussion applies to actual cases, it should be remembered that legal rules vary in different states]

QUESTION OF THE MONTH

Install Copper Water Tube in Ceiling Space?

- *IF YOU DON'T HAVE the answer to a heating, piping or air conditioning problem, chances are someone else does — or can be helpful on part of it. That's the reason for HPAC's Question of the Month "idea exchange."*

- *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

- *RECENTLY one of HPAC's readers asked if it would be satisfactory to install solder joint copper water tube in corridor suspended ceiling spaces in preference to making the installation in a tunnel below the corridor. The question was referred to several authorities who have replied based upon their experience. Their answers are given here, following the question itself. Other comments for publication will also be welcome.*

WOULD IT BE a satisfactory solution to install solder joint copper water tube, including hot, cold, recirculated and hose bibb lines, in corridor suspended ceiling spaces in preference to installation in a tunnel below the corridor? The first solution has of course the lower first cost but due to the possibility of leaks, it may prove the more troublesome, if not more expensive in the long pull. With a tunnel, the piping can be easily inspected and maintained.

I would appreciate knowing what has been the experience of others on this problem.—M.M.H.

D. L. MILLS—

IN ANSWER to this question, one need only think of the countless copper tube installations throughout this country that have been giving trouble-free service for years.

A prime objective with any piping system is that it be leakless under operating conditions. Properly made soldered joints between copper water tube and fittings are no more apt to leak under suitable service conditions than properly made joints in a piping system using threaded fittings. The proof of that statement is borne out by the fact that it is common practice today to locate hot and cold water lines between partition studs or floor or ceiling joists. This is generally done with complete confidence, regardless of the type of joints in the piping system.

The rigid inspection methods and the reputation that the leading producers of copper tube and fittings have for quality products insure proper tolerances that produce suitable clearances between the OD of the tube and the ID of the sockets of fittings for good soldering.

Proper soldering technique is now a common accomplishment of the average mechanic installing copper piping systems. Thorough cleaning of the outside surface of the tube end and the inside surface of the socket of the fitting that engages it is, of course, very important in order to produce satisfactory tinning of these areas. Specific instructions for making soldered joints are available without charge from the Copper & Brass Research Association, 420 Lexington Ave., New York 17, and also from the producers of copper water tube and solder type fittings.

"M.M.H." need not worry about installing copper tube piping systems in the space above suspended ceilings if the products of reputable manufacturers are used and dependable contractors make the installation.—D. L. MILLS, Rome, N.Y.

HENRY E. VOEGELI—

IF THE DESIGN offers an advantage in running the hot and cold water lines, or hot water heating lines in the furred space of a corridor ceiling, then they should be put there by all means. There is no better joint than one that is made in copper tube by sweat soldering, or possibly by silver brazing. In either case the joint will develop the full strength of the tubes if the work is done properly. There is but very little danger of future leaks if the parts that are to be united, namely, the outside of the tube and the socket of the fitting, are thoroughly cleaned and fluxed, and if the joints are then sweat soldered, and the system subjected to a 200 lb hydrostatic test for 4 hr. A strong and durable joint can be made with 50/50 lead tin solder, a solder containing 95 percent tin and 5 percent antimony, or by brazing.—HENRY E. VOEGELI, Development Engineer, The American Brass Co.

W. M. MULHOLLAND—

IT IS VERY COMMON practice to install copper tube and solder joint fitting water lines behind walls or any other enclosure, assuming that an adequate pressure test is made before plastering. Of course, an accessible tunnel location is preferable for any kind of piping if questionable workmanship or an aggressive or corrosive water is involved, but normally it would not seem to justify the expense.—W. M. MULHOLLAND, Engineer, Tube Products, Chase Brass & Copper Co.

READER ASKS —

"How To Insulate Double Offset Expansion U Bends?"

"We are in the process of installing about 300 ft of 4 in. high pressure steam line in our plant. We have double thickness 85 percent magnesia insulation for the straight pipe, but we are at a loss as to how best to insulate the 4 in. double offset expansion U bends.

"I would be interested in learning from other of HPAC's readers about their methods of insulating these double offset expansion U bends, including any problems that have been encountered and how they have been solved." — F. R.

[You are invited to comment on this question, giving actual examples if possible. Address the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.]

Automatic Panel Heating Lures Zoo Snakes

. . . and other reptiles

ALL 500 of the snakes and alligators, crocodiles, lizards and turtles in the new reptile house opened recently at New York's Bronx zoo will enjoy temperatures exactly to their liking in cages and artificial ponds. Take a rattler, for example, a fellow who's sure to suffer all extremes of temperature in the wilds of North America. Now, every day of the year, he'll bask or wriggle on a panel heated to 80 F — the one temperature that he enjoys the best. A south Asia cobra in a nearby cage will enjoy 85 F — the temperature that he likes best.

The new approach to snake comfort is the brainchild of Dr. James A. Oliver, curator of reptiles at the zoo. Working with Harry H. Bond, consulting heating engineer, and Minneapolis-Honeywell engineers, he has come up with one of the neatest tricks in zoo management. By grading the panel heating up to the front of the cages to the exact temperature preferred by the snakes, he keeps the creatures at the location where they can best show off to the public.

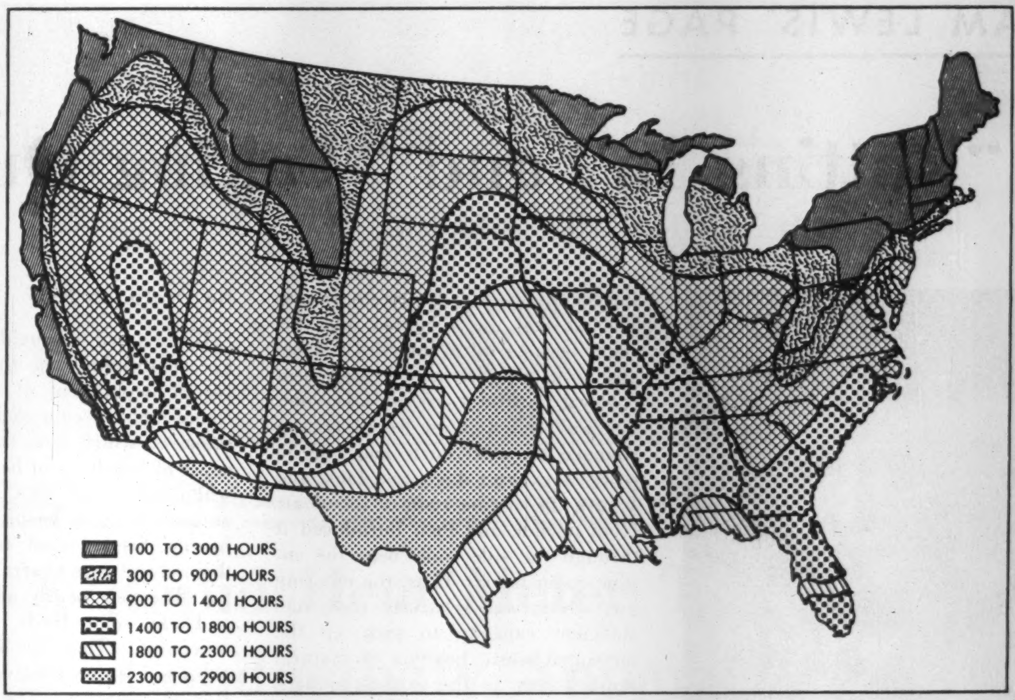
Once before, radiant heating was used in zoo snake cages but without controls. The inevitable happened. One day the panels got too hot, and the snakes were literally fried. Naturally Dr. Oliver wants to prevent this. To meet Dr. Oliver's requirements, Mr. Bond specified two or three coils in the front of cages. These generate enough heat to keep the rest of the cage warm but not enough heat to encourage a snake to slink off to the rear of the cage.

To control the panel heating system, capillary tubes are mounted near the surface of the panels. The tubes connect with thermostats mounted outside the cage. The thermostats, in turn, control a pneumatic valve to the coils.

So that reptile house keepers do not have to read temperatures at each cage, engineers have provided an electronic recorder at a central location. An attendant can check the temperatures in any cage by pushing a button opposite a numbered listing of the cage. Posted on the recorder panel is the desired temperature for each cage.

The temperature of the water flowing into small pools in the cages and the alligator and crocodile ponds is also thermostatically maintained. To prevent the crocodiles and alligators from continually submerging themselves in the water from public view, the temperature of the concrete outside the ponds is set more to the creatures' likings — via panel heating.

Thus, with the aid of scientifically controlled radiant heating, the new Bronx zoo reptile house is shaping up as the leader in its field. The snakes, least of all, have no complaints — they seem to be charmed by automatic heating.



THIS MAP is a suggested guide for determining the operating hours for air conditioning throughout the U. S. It shows that there is a need for air conditioning practically everywhere. The map has been based upon the average number of hours that the outdoor dry bulb temperature exceeds 80 F each cooling season and has been developed by the Frigidaire Div. of General Motors Corp.

How Many Hours Is Air Conditioning Needed?

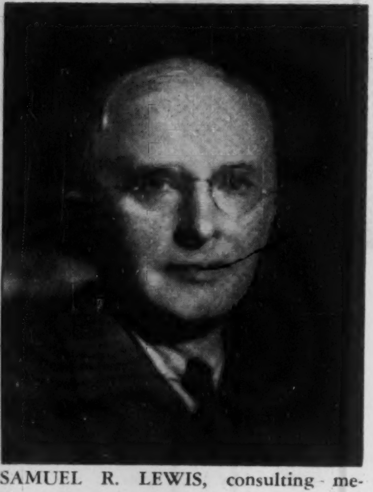
Hot weather is here. The weather map showing different zones of operating hours for air conditioning equipment, is a suggested guide for the U. S. It shows that there is a need for air conditioning practically everywhere. The map has been based upon the average number of hours that the outdoor dry bulb temperature exceeds 80 F each cooling season.

Various weather bureau and other temperature map patterns were studied along with other published weather information that had been accumulated over the years. In addition to this data that was collected, surveys and experience from others in all parts of the country provided valuable background information for the map patterns shown.

This map is not intended to give an authoritative and accurate weather summary of summer temperatures in every town, city and community throughout the country. It is intended to provide a basis for *estimating* zones of comfort air conditioning. The map shows the approximate hours that the outdoor temperature is 80 F or above, but the operating time of air conditioning equipment would be less than the hourly figures indicate because the unit will usually cycle on and off, even when the temperature is considerably higher than 80 F.

SAM LEWIS' PAGE

"Putting In" and "Taking Out"



SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems. This month, he discusses the importance of proper introduction and exhaust of air for air conditioning and ventilating several large installations.

THIS IS TO SUGGEST the importance of "putting in" as well as "taking out." Of course, a bank account isn't much good unless one occasionally puts in, so that eventually some of it may be taken out. With a bank, it is no use to try to take out unless one has put in previously.

Hot Hotel Floor Corrected

I remember a very hot hotel lobby floor in a midwestern city. It was hot because the engine room, directly under the lobby, was well crowded with machines and steam pipes. Patrons received the hot foot treatment when lounging in the lobby chairs, most of the time. Someone failed to keep the floor cool by forcing air from outdoors through sheet metal ducts between the engines and the ceiling over them. There wasn't enough air to do the cooling and there were not enough escape ports for the air to enter the engine room. The air that was admitted into this room became warm and did not begin to accomplish the desired heat removal because it was not taken out.

I was called in to fix things. I changed the inlet ducts and fans to serve as exhaust ducts and fans, and I gave the engine room a lot of air from outside and then introduced it through the side walls near the engine room floor. Thus, the entering air, which was relatively cool, had sufficient capacity to pick up the unwanted waste heat on its natural upward way to the exhaust outlets, where it was taken out. The proprietor still allows me to lounge in that lobby.

Cool Air "Put In" at Floor

At the plant of a specialist in scientific heat treatment of metals, men stood in front of hot furnaces, observing conditions and occasionally the men removed or stirred up some of the incandescent metal. After a while, I learned that the ideal place to introduce air for cooling the men in this laboratory was near to, or preferably *through* the floor, with exhaust outlets above the furnace doors. This is another case where we had to "put in" as well as "take out".

When cooling the kitchens of hotels and restaurants, merely to attempt to remove the heat by air exhaust is generally futile unless one provides a regulated and well distributed supply of air. This air must not be very much cooler than the ambient air temperature in the kitchen. The fewer windows the better in any public kitchen, since open windows can short circuit the desired air supply distribution. One well known hotel complained about the heat near the pastry bake oven. This complaint became a compliment after I was able to deliver the cooling air through a grating in the floor directly in front of the oven.

No Drafts on Rats

When asked to provide refrigerated air conditioning in the cancer research department of a hospital, I found a large room enclosing narrow tables on which were the small metal cages of hundreds of beautiful, clean, white mice and rats. These little animals, born in hospitals and never having been forced to forage for themselves, were unafraid and friendly. They eat nearly all of the time, and like some birds, would starve otherwise. They are not like men, equipped with a relatively large food storage capacity. The rodents give off a lot of heat and might catch cold if subjected to drafts of air much colder than the rather warm and damp air normally surrounding them.

With apparent success, proved over several years service, I introduced the relatively cool air horizontally near the floor, so that it flows upward from under the narrow tables that support the cages. The spent air was removed through grilles to ducts in the ceiling above the cages.

Bank Problem Solved

A very large room in a bank has the outside walls necessarily remote from the crowded interior areas. There are no available partitions against which to install vertical supply and exhaust ducts to serve the central area. The solution that worked well was to extend horizontal supply and exhaust ducts across the room overhead, each pair of ducts about 20 ft from the next pair. A combined inlet-outlet diffuser was placed in the ceiling at the center of each construction bay, approximately every 20 ft along these ducts. The air was diffused horizontally close to the ceiling in four directions, while the spent air grille was in the center of the diffuser so that the warm air would flow directly upward from the people.

Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL SECTION

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

A Rapid Heat Meter Thermal Conductivity Apparatus

By J. D. Verschoor* and Ada Wilber**
Manville, N. J.

SUMMARY — This paper gives a description of an apparatus developed to determine the thermal conductivity of thermal insulations quickly and simply. Although this rapid apparatus does not have the inherent absolute accuracy of a properly operated guarded hot plate, it is shown to have high test precision.

The heat meter apparatus can measure the conductivity of many samples in a short period of time. Consequently it is well suited to measure the conductivity of large groups of samples encountered in statistically designed experiments.

While the results obtained with the heat meter are of high precision, the absolute accuracy is subject to bias introduced by the calibrations of the heat meters, the imperfect sample guarding, and other minor errors. Ordinarily this is not a serious handicap because reference samples can be included in the test program. Direct comparisons made between the samples are frequently of as much value as results of high absolute accuracy.

THE NEED of an apparatus to determine the thermal conductivity of materials rapidly has become increasingly more apparent. Although guarded hot plate thermal conductivity apparatus (*ASTM* Test Method C-177)[1] leave little to be desired in the way of absolute accuracy of test results, they are extremely slow in operation and require the attention of skilled personnel. Frequently as long as two weeks are required to run a series of points on a single material with a guarded hot plate apparatus. As a result, the number of materials that can be tested in a period of time is very limited. This can be especially restricting for insulation development programs where statistically designed experiments require tests on as many as 16, 25, or even more different samples in order to obtain a reliable picture of the effect of a variable on conductivity.

The guarded hot plate apparatus can be speeded up somewhat by the incorporation of automatic balance controls.[2] However, the attainment of steady-state heat flow with the guard at precisely the same temperature as the test section is inherently a slow process.

Recently considerable work has been done with transient heat flow apparatus in which a slender probe is utilized.[3–6] With these apparatus data need be taken for only a very short period of time. A chart by Hooper and Chang[5] greatly simplifies the calculation of conductivity from these data. However, the construction of a probe is difficult. The ratio of the heated length of the probe to its diameter should be at least 100 to 1. Since it is desirable to keep the length short, of necessity the diameter becomes very small. D'Eustachio[3] mentions probes with an outside diameter of 0.030 in. and smaller containing a bifilar spiral heater winding and a thermocouple junction. Furthermore, because the rise in temperature of the probe during a test is small, accurate measurement of this temperature rise is difficult.

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[1] Exponent numerals refer to References.

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It was with this background that the authors undertook the development of a rapid conductivity tester. Speed, simplicity and precision without necessarily high absolute accuracy were the requirements. Of these simplicity was considered most important.

Design

The upper half of each unit of the apparatus is raised by a crank so that test samples may be inserted easily and quickly. The temperatures within the apparatus are all controlled automatically and do not require any attention from the operator. The only physical measurements needed are eight thermocouple potential readings and a thickness determination by means of a dial gage incorporated in the apparatus. By means of a single slide rule calculation involving a constant for the apparatus the thermal conductivity can be determined.

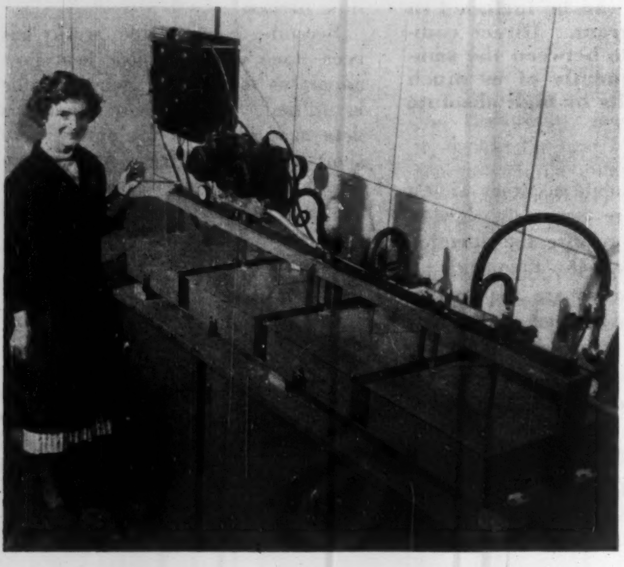
In order to achieve simplicity some overall accuracy was sacrificed. An example of this was in the assumption that the temperature difference across the sample varies directly with the difference in millivoltage between the hot- and cold-surface couples. As the response of a thermocouple is not exactly linear with temperature, there is a slight error. The assumption made, however, permits a single potentiometer reading for temperature difference which eliminates two conversions with a thermocouple chart and a subtraction. Similarly the allowance of 1½ hr for steady-state heat flow may not be sufficient in all cases. However, if a testing procedure is strictly adhered to these inaccuracies will not affect the testing precision, and the conductivity of one sample may be accurately compared with another.

Description of Apparatus

The rapid conductivity apparatus (Fig. 1) consists of four units each capable of testing four samples in a working day. This amounts to 80 tests a week or a potential of over 4,000 a year. Basically each unit of the heat meter conductivity apparatus consists of a constant-temperature hot plate and a constant-temperature cold plate to maintain a temperature gradient through the test sample, and a heat flow meter in series thermally with the test sample to measure the rate of heat transfer.

The size of test samples for the rapid conductivity tester was set at a nominal thickness of 1 in., 9 × 9 in. square minimum, 12 × 12 in. square maximum. The minimum size allows for an area surrounding the heat meter of about two times the thickness to minimize edge heat losses. These size limits also permit the testing of circular samples of 10 to 12 in. diameter. With the present apparatus, samples of 1 in. nominal thickness may vary between 0.9 and 1.3 in. Samples much thicker than 1.3 in. cause no mechanical difficulties in testing; however, the results are not always in good agreement with tests on regular samples. Under special conditions samples as small as ½ × 6 × 6 in. can be tested, although again these results are not always directly comparable with samples of standard size. For these thin sample tests a dummy aluminum plate ½ in. thick is inserted in one of the units.

Two of the test units, designated V and W, are designed to operate at a mean temperature of approximately 150 F; the other two units U and T at 350 F and 500 F mean respectively. The low-temperature units have steam-heated hot plates and cold plates cooled by tap water. Both of these provide constant temperatures without the use of expensive controls. Of course there is a seasonal variation of tap water of about 40 deg; however, the variation during any day and from one day to the next is small enough to be of little consequence. During the cold-



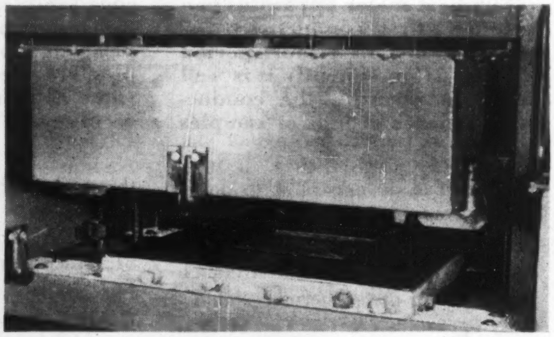


Fig. 2—Conductivity apparatus open showing heat flow meter mounted on steam plate

Fig. 1—Heat meter rapid conductivity apparatus

est part of the winter the mean temperature of the low-temperature units is in reality about 130 F instead of the nominal 150 F. The high-temperature units (350 F and 500 F mean) have steam-heated cold plates. The hot plates in these units are heated electrically by strip heaters and are maintained at constant temperatures of about 480 F and 780 F respectively by controllers.

In order to simplify plumbing connections each unit has the steam plate as the lower or stationary plate (Fig. 2). By mounting a heat flow meter directly on each steam plate in all the units, all the meters may be calibrated at substantially the same temperature, regardless of the temperature range of the unit in which they are used.

It is important that the steam be held at constant pressure to insure constant temperature. Any changes in the steam temperature affect the instantaneous rate of heat flow and lead to unstable readings. A precision pressure reducing valve with individual steam traps on each plate was not able to hold the steam temperature constant because of the action of the traps. Without the traps the plates operate at atmospheric pressure and so maintain a constant temperature. A mixer with a water-spray nozzle condenses excess steam from the plates without adding a pressure drop.

The upper plates in the units (hot surface for the high-temperature units, cold surface for the low) have grooves milled in the contact surfaces with thermocouples in these grooves to measure surface temperatures. Because it was impossible to cut grooves in the heat meters mounted on the lower plates, the temperatures of these surfaces are determined by fine wire thermocouples stretched across the heat meter. The hot- and cold-surface thermocouples are connected in series differential to simplify the operation of taking data.

The heat flow meters were of a standard type and consist of 360 pairs of silver-constantan thermocouples located between the two surfaces of a synthetic resin wafer 3/64 × 4-1/2 × 4-1/2 in. A flow of heat through the wafer causes a small difference in temperature between the faces. The large number of thermocouples multiplies the minute voltage of a single pair of thermocouples across the small temperature difference to the point where it can be conveniently measured. While the heat meters are provided with a calibration curve by the manufacturer, it has been the practice to calibrate them periodically in a guarded hot plate. This is done at three temperatures near 212 F, with the value at 212 F interpolated. One heat meter was found to have a different calibration with heat flow in one direction than in the reverse direction. Accordingly it is necessary to calibrate and use the meters with the same heat flow direction. Experience over the past two years has shown that, with one exception, the calibrations have remained fairly constant with time. The calibration of the defective meter increased by a factor of 200 percent over a six month period. It was subsequently replaced by the manufacturer.

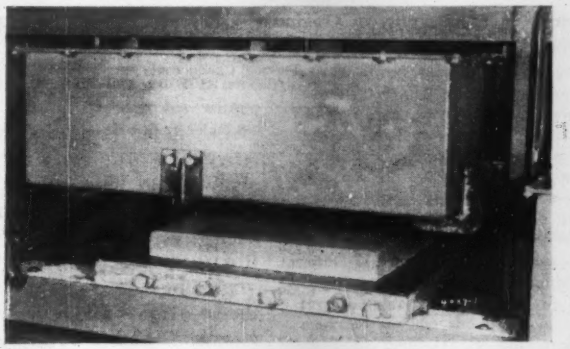


Fig. 3—Conductivity apparatus open showing test sample in place

Each upper plate has an adjustable stud fastened to the top, as shown in Fig. 1. The distance between the top of the stud and the frame of the apparatus is directly related to the thickness of the sample in the apparatus. This means that a dial gage placed on the frame with its foot on the stud indicates the sample thickness when the length of the stud is adjusted properly.

A series of tests was made which indicated that with a test sample in place a heating time of 1½ hr was long enough to approximate steady-state heat flow conditions. Fig. 3 shows test sample in place. Additional time did not improve the test accuracy appreciably. Following the 1½ hr conditioning, four readings each of the heat meter potential and the temperature difference potential are taken at 5 min intervals. The quotient of the averages of these readings times the sample thickness and the calibration constant is the conductivity of the material.

The temperatures of 150 F mean, 350 F mean, and 500 F mean are representative ranges for many commercial insulations. To cover the higher-temperature insulations, a rapid conductivity apparatus of the heat meter type is currently being constructed at this laboratory. The range of this apparatus will include 1000 F mean temperature.

Apparatus Precision and Accuracy

To determine the precision and accuracy of the heat meter apparatus, a test program was carried out to show (*a*) comparison between the results of a guarded hot plate apparatus (*ASTM* Test Method C-177)[1] and the heat meter on identical samples, and (*b*) the reproducibility of results possible with this apparatus.

For these tests three samples of different materials which had previously been tested in the guarded hot plate apparatus were chosen. These samples were to represent typical

Table 1—Reproducibility of Conductivity Results

	Day	Thermal Conductivity Btu/(hr) (sq ft) (F deg/in.)		
		Sample		
		A	B	C
Heat Meter V (150 F Mean)	1	0.260	0.344	0.601
	2	0.256	0.336	0.623
	3	0.259	0.334	0.603
	4	0.261	0.334	0.606
	Avg	0.259	0.337	0.608
Heat Meter W (150 F Mean)	1	0.262	0.346	0.643
	2	0.261	0.335	0.632
	3	0.261	0.337	0.614
	4	0.261	0.338	0.615
	Avg	0.261	0.339	0.626
Average conductivity at 150 F mean		0.260	0.338	0.617
Standard deviation		0.002	0.005	0.012
Conductivity as determined in a guarded hot plate apparatus (interpolated)		0.296	0.390	0.672
Heat Meter T (set at 350 F mean, normally at 500 F mean)	1	0.392		0.690
	2	0.380	0.403	0.684
	3	0.375	0.401	0.673
	4	0.376	0.404	0.685
	5		0.401	
	Avg	0.381	0.402	0.683
Heat Meter U (350 F mean)	1	0.405	0.414	
	2	0.397	0.415	0.705
	3	0.400	0.410	0.699
	4	0.395	0.410	0.710
	5			0.704
	Avg	0.399	0.412	0.705
Average conductivity at 350 F mean		0.390	0.407	0.694
Standard deviation		0.006	0.002	0.006
Conductivity as determined in a guarded hot plate apparatus (interpolated)		0.415	0.462	0.733

Table 2—Reproducibility of Conductivity Results — Operator II

	Thermal Conductivity Btu/(hr) (sq ft) (F deg/in.)		
	Sample		
	A	B	C
Heat Meter V (150 F mean)	0.264 0.261	0.337 0.335	0.604 0.632
Heat Meter W (150 F mean)	0.262 0.251	0.334 0.333	0.603 0.608
Operator II average	0.260	0.335	0.612
Operator I	0.260 ± 0.002	0.338 ± 0.005	0.617 ± 0.012
Heat Meter U (350 F mean)	0.398 0.406	0.420 0.418	0.703 0.712
Operator II average	0.402	0.419	0.708
Operator I	0.399 ± 0.006	0.412 ± 0.002	0.705 ± 0.006

Table 3—Moderate-Temperature Block Insulation Comparison of Thermal Conductivity

Sample		Density, lb/cu ft	Thermal Conductivity Btu/(hr) (sq ft) (F deg/in.)	
			At 150 F mean	At 350 F mean
Regular	1	10.4	0.34	0.42
	2	11.1	0.35	0.44
	3	10.1	0.33	0.42
	4	11.3	0.36	0.44
	Avg	10.7	0.34	0.43
Modified	1	10.1	0.33	0.42
	2	10.5	0.33	0.42
	3	10.5	0.34	0.43
	4	10.5	0.33	0.42
	Avg	10.4	0.33	0.42

materials that will be tested in the heat meter units.

Typical Materials	Designation
Mineral wool insulation	A
Moderate-temperature insulating block	B
High-density insulating panel	C

These samples were tested in rotation in each of the four heat meter units for four successive days. The results of this series of tests, given in Btu per (hour) (square foot) (Fahrenheit degree per inch), are included in Table 1.

Comparison of these results with the conductivities as determined in the guarded hot plate apparatus showed that the heat meter values were consistently lower. The ratios of results, hot plate to heat meter, expressed in percentages ranged between 105 and 116, and averaged 111. The degree of error does not seem to be attributable to specific samples or to the heat meter unit used.

Instead of trying to compensate for these differences, it was decided to recognize that the apparatus is only fair in absolute accuracy and to concentrate on the reproducibility of results. Since materials submitted for determination of thermal conductivity by the heat meter apparatus are parts of tests designed to be evaluated by comparison, the properties of reproducibility and relative accuracy are much more important than absolute accuracy. To satisfy these conditions it was desired that there be both good duplication of results between units run at the same mean temperature (between units T and U and between V and W) and, more important, close repetition of results when a sample is retested in the same unit.

By statistical methods it was shown that no significant difference exists between the conductivities determined by the two 150 F mean heat meter units, V and W. The same analysis showed that a small but significant difference does exist between the results of unit T run at 350 F mean and unit U for all samples tested. However, measures to counterbalance this were not attempted since unit T was designed primarily for use at 500 F mean.

Further analyses were performed to determine the reproducibility of results when the same sample is retested in the same heat meter unit. Standard deviations of less than 0.006 conductivity units were found for samples A and B. [The standard deviation *s* defines the range from the arithmetic mean $\bar{x}$, ($\bar{x} \pm s$) within which approximately two thirds of the results would lie if an infinite number of tests were performed and the distribution of results normal.] These results show that the reproducibility which the heat meter units are capable of producing consistently is well within the range necessary for the tests being carried on.

The first series of tests (Table 1) was made by an operator familiar with the use of heat meters for rapid determination of thermal conductivity. A second operator experienced in the use of a potentiometer for reading millivoltages but entirely unfamiliar with the heat meter apparatus ran a second series of tests after a limited training period. Conductivities obtained by Operator II and comparisons between these conductivities and those recorded by Operator I are given in Table 2.

The close agreement between the conductivities, as determined by these two operators, is further evidence of the generally good reproducibility of results possible with this apparatus for the samples tested.

The somewhat poorer reproducibility of conductivity results for sample C as compared with the other materials tested is believed the result of several factors. During this series of tests the sample shrank from 0.94 to 0.91 in., and exposure to high temperatures caused it to warp. This was especially noticeable following tests in the heat meter units (T and U) which were run with hot-surface temperatures about 500 F. Because of the hardness, strength, and warping characteristics of this material, the sample under test made poor thermal contact with the hot and cold surfaces of the heat meter units compared with mineral wool, for example. The amount of warping and degree of success in making good thermal contact could cause the observed variation in conductivity results.

Typical Applications of the Heat Meter Apparatus

The heat meter apparatus for rapid thermal conductivity determinations is of good precision but not necessarily of good accuracy. As such it is ideal for use in comparison studies in groups of samples where information is desired on the effect of several variables on conductivity. It should not be used on a single sample of material to obtain *the conductivity* of this material. In other words, the heat meter apparatus will give a precise relative conductivity value for a particular sample which must be related to other samples of a similar nature or to a standard.

The use of the apparatus can best be illustrated by citing in detail five actual examples of problems where the heat meter apparatus has been used successfully.

1. *Moderate Temperature Block Insulation*: The problem was to determine if the conductivity of an insulation modified to improve a specific physical property was as low as that of the regular insulation. The heat meter apparatus is ideally suited for making this type of comparison. On successive days the same pilot plant equipment was used to make both the regular insulation and the modified insulation. Four samples of each type were tested in the heat meter apparatus at two mean temperatures each. The results of these tests are in Table 3.

The data show even without a detailed statistical analysis that the conductivity of the modified insulation was substantially that of the regular material. The small difference in results is easily accounted for by the slight difference in average density. Total test time required for 16 tests: two days on two of the four units.

2. *Friction Material*: Information was desired on the change in thermal conductivity of a friction material when it was impregnated and brass wire was added. With these materials high conductivity is desired in order to improve the heat dissipation from the friction surface. Four sets of samples were prepared, impregnated and unimpregnated, with and without brass wire. As the thickness of this friction material was ⅛ in., it was necessary to use 8 layers to obtain the required 1 in. test thickness.

As shown in Table 4, both impregnation and the addition of brass wire increased the conductivity, the impregnation being about twice as effective. Total time required: one day on one of the four units.

3. *Experimental Block Insulation*: This was a new material with little information available on the effect that variables in composition had on thermal conductivity. It was decided that a Graeco-Latin square type of statistically designed experiment would yield the most data. Preliminary work showed that four variables, three factors in composition and density, would probably have the most effect on conductivity. Five widely spaced levels of each of these variables were studied in a 25 sample square. The composition of each individual sample and its density were varied in a set pattern so that each level of each variable occurred in combination with every other level of the other variables only once. Incidentally, following conductivity tests the samples were broken in a strength machine so that the effect of composition on both conductivity and strength were studied statistically with a single set of samples.

Average conductivity values with respect to each variable were computed. Since each individual average was taken over five tests the results are reliable. This means that the results of all 25 tests were used in studying each of the four variables. Because these same 25 tests were used four times, this is a true economy of both sample preparation effort and testing effort.

The results of this test program revealed how to make the best compromise between conductivity and strength based on the information available. Even more important, they pointed to the areas where further research was needed. Time required for conductivity test: 6¼ days on one of the four units.

4. *Rigid Fibrous Insulation*: Information was needed on the effect of heat flow direction on thermal conductivity in a rigid fibrous insulation. Strips of the material were cut 7/16 x 7/16 x 9 in. These strips were laid together side by side and the conductivity determined both with the heat flow normal to the original face, and with the strips rotated 90 deg, heat flow normal to the lengthwise edge. These same tests were also made in a guarded hot plate apparatus.

The results of these tests in Table 5 showed the increase in conductivity with the shift of heat flow direction. Because of cracks in the samples the check between the two apparatus is not exact; however, since only qualitative results were required the heat meter results were adequate. Test time required for the hot plate tests on two samples with one apparatus: 15 working days. Test time required for heat meter tests including

Table 4—Friction Material—Comparison of Thermal Conductivity

	Thermal Conductivity Btu/(hr) (sq ft) (F deg/in.)		
	Wire	No Wire	Avg
Impregnated	2.5	2.1	2. 3
Unimpregnated	1.6	1.5	1. 6
Avg	2.1	1.8	

one replication: One day on one of the four units.

In another comparison of the effect of heat flow direction on thermal conductivity, a group of four samples which had been tested earlier was retested in the heat meter apparatus. While not agreeing exactly in absolute values the results from two methods of test were in the same order so that the same conclusions would be drawn from either set of data. Test time required to make a series of determinations on four samples with one hot plate apparatus: 38 working days. Test time required for heat meter test on four samples: One day on one of the four units.

5. *Rigid Panel Insulation*: The effect on thermal conductivity of the three variables of amount of fiber, fiber length, and source of one of the constituents was needed. A factorial type of experiment was designed in which two levels of each of the three variables were investigated. This required eight different kinds of samples. Four replications were made for a total of 32 samples. All these samples were tested in the heat meter apparatus at 150 F mean temperature. As the experiment was originally planned the density of the samples was to be held approximately constant, the only variables being the three previously mentioned. A simple analysis of variance would then have shown the true significance of any conductivity differences observed. Since the samples were not all prepared at exactly the same density, the extremes being 30.9 lb per cu ft and 40.4 lb per cu ft, it was necessary to take density into account as a variable in the analysis. It was obvious from an inspection of the data that the amount of fiber was the most important variable of the three. Accordingly, the conductivity data were divided into two groups according to the amount of fiber in the samples. A regression of conductivity *vs.* density was calculated for each of these groups of 16 samples. The difference in the regression lines was caused by the change in fiber content. The effects of the other two variables were studied by the individual deviations above and below the regression lines.

Table 5—Rigid Fibrous Insulation—Comparison of Thermal Conductivity

	Thermal Conductivity Btu/(hr) (sq ft) (F deg/in.)	
	Heat Meter at 150 F mean	Guarded Hot Plate at 100 F mean
Heat flow normal to face	0.38	0.41
Heat flow normal to lengthwise edge	0.61	0.70

Because of the large number of tests made, the conclusions drawn in the foregoing program were very reliable. Test time required: Four days with two of the four units.

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6. A Transient Heat Flow Method of Determining Thermal Conductivity: Application to Insulating Materials, by C. P. Lentz (*Canadian Journal of Technology,* June 1952, Vol. 30, p. 153).

JUBILEE AT COLUMBIA BICENTENNIAL

Jubilee Technology Week, September 13 to 17, has been announced by the Department of Mechanical Engineering at Columbia University, New York, to punctuate some particularly pertinent anniversaries as its contribution to the 1954 Bicentennial celebration of the University. The anniversaries to be commemorated are as follows:

10th:	The Refrigeration Research Foundation
20th:	*American Society of Mechanical Engineers* (Refrigerating and Air Conditioning Section, Process Industries Division)
50th:	*American Society of Refrigerating Engineers*
60th:	THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
90th:	Engineering School at Columbia University
200th:	Columbia University

The program of the week will consist of two parts tentatively arranged as follows: September 13-15—Conference on Refrigeration and Air Conditioning with presentation of papers and lectures. Among the organizations invited to assist in developing the program are the *TRRF, ASME, ASRE* and ASHVE. September 15-17—Conference on Industrial Ventilation, jointly sponsored by the Department of Mechanical Engineering, Columbia University, and New York State Department of Labor, Division of Industrial Hygiene.

The Jubilee Sessions will be held in Pupin Hall, Columbia University. Registration for each conference will be limited. Inquiries and requests for program information should be directed to Prof. Carl F. Kayan, Department of Mechanical Engineering, Columbia University, New York 27, N. Y.

Philadelphia
in
January

GAMA ELECTS NEW OFFICERS

At the 19th annual meeting of the *Gas Appliance Manufacturers Association* held recently in Chicago, the following officers were elected: *President*—T. T. Arden, executive vice president, Grayson Controls division, Robertshaw-Fulton Controls Co., Lynwood, Calif.; *First Vice President*—W. F. Rockwell, Jr., president, Rockwell Manufacturing Co., Pittsburgh; and *Second Vice President*—A. B. Cameron, president, Ruud Manufacturing Co., Pittsburgh. Two ASHVE members will continue in their posts with *GAMA*: *Treasurer*—L. C. Harvey, president, Affiliated Gas Equipment, Inc., Cleveland; and *Managing Director*—H. L. Whitelaw, New York.

Physiological Responses to Sudden Changes in Atmospheric Environment

Studies of Normal Subjects, Obese, Hyperthyroid and Hypothyroid Patients

By Tohru Inouye*, F. K. Hick**, M.D., R. W. Keeton†, M.D.
and Lionel Bernstein††, M.D., Chicago, Ill.

This paper is the result of research sponsored by The American Society of Heating and Ventilating Engineers and by the United States Public Health Service in cooperation with the University of Illinois, College of Medicine, Chicago, Ill.

SUMMARY — Three groups of women who might logically have an abnormality of body temperature regulation were studied during one hour in a comfortable room, then moved for one hour into a hot humid room, and returned to the comfortable room. The groups were obese, hyperthyroid and hypothyroid. The promptness and ease of their thermal adjustments on entering the hot room confirmed the findings on normal women. The hyperthyroid patients could not endure the heat (98.6 F, 66 percent RH) without a rise in rectal temperature. The quantity of sweat trapped in the clothing accounts for the cool sensation on return to the comfortable room, and explains the need for time to make a complete adjustment. This factor is widely variable from patient to patient, as well as variable between groups of subjects. It should be of much interest to engineers interested in air conditioning.

This report discusses the physiological adjustments made upon sudden entrance and departure from a hot, humid environment by women who have probable abnormalities in the regulation of body temperature. The data may be compared with those of young, healthy women.[1] This study was undertaken to determine alterations in physiological responses in the presence of handicaps on heat loss or heat production. Alterations in the responses would provide an understanding of means by which the body adjusts heat loss under adverse environmental conditions. Interference of heat loss is suggested in the obese patients. Their thick layer of subcutaneous fat has been regarded as insulation somewhat comparable to an overcoat. On the other hand, abnormalities in heat production are observed in hyperthyroid and hypothyroid patients. The high heat production of the hyperthyroid would require a high heat loss, and the low heat production of the hypothyroid a low heat loss, to maintain normal body temperature.

Method

Young, healthy women, nurses from the Research and Educational Hospitals, were used as controls for this study. Subjects with abnormalities in their heat regulation were selected from the medical services of the Hospital. The physical measurements for all subjects are summarized in Table 1. The oxygen consumption measured by a clinical instrument at the beginning of a three hour test averaged 121 cc/(min) (m^2) for the healthy, 131 cc/(min) (m^2) for the obese, 181 cc/(min) (m^2) for the hyperthyroid and 99 cc/(min) (m^2) for the hypothyroid patients. Assuming all oxygen consumption with a respiratory quotient of 0.82 is converted to heat, these rates of oxygen consumption would correspond to 13.3 Btu/(hr) (sq ft), 14.0 Btu/(hr) (sq ft), 19.2 Btu/(hr) (sq ft), 10.6 Btu/(hr) (sq ft), for the healthy, obese, hyperthyroid and hypothyroid patients, respectively. All subjects reported to the building after a light breakfast or lunch. They rested about ½ hr before entering the test room.

The subjects in this study were dressed in long union suits reaching to the ankles and to the wrists. The union suit was of 90 percent cotton and 10 percent wool, knitted fabric. The suits were rigged with thermocouples to permit observations of skin temperature at 19 locations and the rectal temperature. In addition to these measurements, body weights were observed accurately to 0.02 oz, and thermal sensations were recorded.[2]

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[1] Exponent numerals refer to References.

Presented at the Semi-Annual Meeting of The American Society of Heating and Ventilating Engineers, Swampscott, Mass., June 1954.

Table 1—Physical Characteristics and Ages of Individual Subjects

Subject Classification	Experiment	Age	Height, in.	Weight, lb	Surface Area sq ft
NORMALS					
E.F.	a	24	67	129	18.2
P.K.	a	24	60	115	15.9
M.L.	a	22	68	122	17.8
D.M.	a	23	71	169	21.1
J.M.	a	23	64	120	17.0
T.M.	a	22	64	117	16.8
M.O.	a	26	67	120	17.5
C.C.	b	19	63	124	16.9
J.D.	b	24	64	112	16.4
C.H.	b	21	63	107	16.0
G.K.	b	24	66	116	16.9
M.L.	b	19	64	135	17.9
L.M.	b	20	66	150	19.2
D.My.	b	21	66	146	18.4
D.N.	b	20	62	105	15.5
HYPERTHYROID					
E.S.	a and b	35	63	154	18.6
M.B.	a and b	36	62	104	15.6
E.J.	a and b	27	70.5	138	19.6
E.K.	a and b	43	68	133	18.3
S.G.	a and b	24	64	138	18.0
E.W.	b	18	65.5	118	17.1
Z.H.	b	23	66.5	133	18.2
J.C.	b	54	63.5	185	20.2
L.D.	b	42	66	114	16.9
G.G.	b	61	60.5	125	16.6
S.H.	b	44	64	145	18.3
HYPOTHYROID					
M.F.	a and b	43	61	116	16.1
M.P.	a	39	66.5	146	18.9
E.L.	a	42	67	166	20.1
L.L.[c]	a and b	60	67.5	157	19.7
OBESE					
E.F.	a and b	38	65	174	20.1
M.P.	a and b	37	65	234	22.9
C.P.	a and b	24	64	213	21.7
E.S.	a	22	66.5	181	20.7
S.P.	a and b	43	62.0	354	26.2
M.G.	a and b	21	64.5	172	20.1
C.H.	a	29	67.0	194	21.5
A.H.	a	50	64.0	280	24.3
C.V.	b	35	64.0	330	26.3
C.M.	b	45	64.0	247	23.2

[a] Subjects participated in experiments in which they were moved from a comfortable to a hot humid room and subsequently returned to the comfortable.

[b] Subjects participated in experiment in which they remained in a comfortable environment (76 F, 30 percent RH) for three hours.

[c] Male.

Table 2—Summary of Averages of Mean Skin Temperature, Rectal Temperature, Thermal Sensation and Heat Loss by Vaporization for Normal, Hyperthyroid and Obese Subjects Kept for Three Hours in a Room at 76 F and 30 percent RH

Time of Observations	Subject Classification		
	Normal	Hyperthyroid	Obese
	Mean Skin Temperature—F		
60 min[a]	91.2	92.4	91.5
120 min	90.3	92.0	91.3
180 min	90.0	91.7	90.8
	Rectal Temperature—F		
60 min	98.6	98.8	98.8
120 min	98.6	98.5	98.5
180 min	98.6	98.5	98.5
	Thermal Sensations[b]		
60 min	4.1	4.2	4.0
120 min	4.0	4.1	4.0
180 min	4.1	4.1	4.0
	Heat Loss by Evaporation—3rd Hour		
Btu/(hr) (sq ft)	4.35	7.58[c]	3.77

[a] Time from entrance into test room.

[b] Thermal sensations are numerically described in which 4 = thermal neutrality (comfortable), 5 = slightly warm, 6 = warm and 7 = hot; 3 = slightly cool, 2 = cool and 1 = cold.

[c] Indicates significant differences of this group average from the normal.

Table 3—Group Averages of Mean Skin (*MT*$_s$) and Rectal Temperature (*T*$_r$), Heat Loss by Evaporation and Thermal Sensation (*TS*) for Each Group of Subjects, First in the Comfortable Room and Then in the Hot Humid Room.

Observations	Subject Classification			
	Normal (7)[a]	Hyperthyroid (5)	Hypothyroid (4)	Obese (8)
COMFORTABLE ROOM				
76 F, 30 percent RH				
After 60 min				
MT_s (F)	91.6	92.2	90.6	91.2
T_r (F)	98.4	98.8	98.5	98.5
TS	4.0	4.4	4.0	3.9
Heat Loss by Evaporation Btu/(hr) (sq ft)	4.4	8.5[b]	5.0	5.6
HOT HUMID ROOM				
98.5 F, 66 percent RH				
On Entrance				
TS	6.1	6.4	6.2	6.7
After 10 min				
MT_s (F)	96.8	97.4	95.6[b]	96.0
T_r (F)	98.3	98.9	98.5	98.4
Change in MT_s in 10 min F deg	+5.2	+5.2	+5.0	+4.8
Change in T_r in 10 min F deg	−0.1	+0.1	0.0	−0.1
Time of Onset of Sweating (minutes)	19.8	6.5[b]	13.4	4.1[a,d]
Amount of Sweat in Hour				
In ounces	4.8	8.4[b]	2.3[c]	6.3
In oz/sq ft	0.27	0.49[b]	0.12[c]	0.22

[a] Number of subjects in a group.

[b] Indicates significant difference of this group average from the normal.

[c] Indicates strongly suggestive difference of this group average from the normal.

[d] One patient required 59 min to sweat. This value placed her statistically outside of the group; hence, her value was excluded from the average.

Table 4—Tabular Presentation of Sweat Data on Individual Subjects

Subjects	Comfortable Room Before Hot Room	Hot Room		Comfortable Room After Hot Room	
	Btu/(hr) (sq ft)	Time of Onset of Sweating, min	Sweat Oz/(hr.) (sq ft)	Accumulated Sweat oz/sq ft[a]	Heat Loss by Evaporation Btu/(hr) (sq ft)
NORMALS					
E.F.	3.7	17	0.32	0.25	11.9
P.K.	5.0	10	0.20	0.20	15.1
M.L.	4.5	4	0.15	0.14	10.6
D.M.	5.1	35	0.27	0.24	14.2
J.M.	3.0	10	0.39	0.33	13.3
T.M.	5.3	31	0.10	0.11	9.7
M.O.	4.5	3	0.45	0.34	9.6
HYPERTHYROID					
E.S.	11.0	4	0.21	0.11	15.2
M.B.	13.9	3	0.61	0.25	22.5
E.J.	7.0	5	0.36	0.07	11.4
E.K.	4.3	14	0.57	0.29	18.4
S.G.	6.2	8	0.69	0.35	24.4
HYPOTHYROID					
M.F.	5.5	5	0.10	0.07	9.5
M.F.	5.6	3	0.22	0.10	9.9
E.L.	4.7	32	0.14	0.07	5.1
L.L.[b]	4.2	14	0.02	0.04	6.0
OBESE					
E.F.	6.2	10	0.33	0.19	17.1
M.P.	3.9	2	0.26	0.13	10.8
C.P.	3.6	2	0.15	0.06	9.6
E.S.	4.1	5	0.06	0.19	14.2
S.P.	7.8	2	0.003	0.02	6.4
M.G.	4.5	59[c]	0.22	0.01	11.7
C.H.	6.3	7	0.46	0.23	15.1
A.H.	8.8	2	0.30	0.16	15.3

[a] At time of re-entry into comfortable room

[b] Male

[c] The analysis of data of obese women excludes this subject since 59 min for the time of onset of sweating is statistically not representative of this group of subjects.

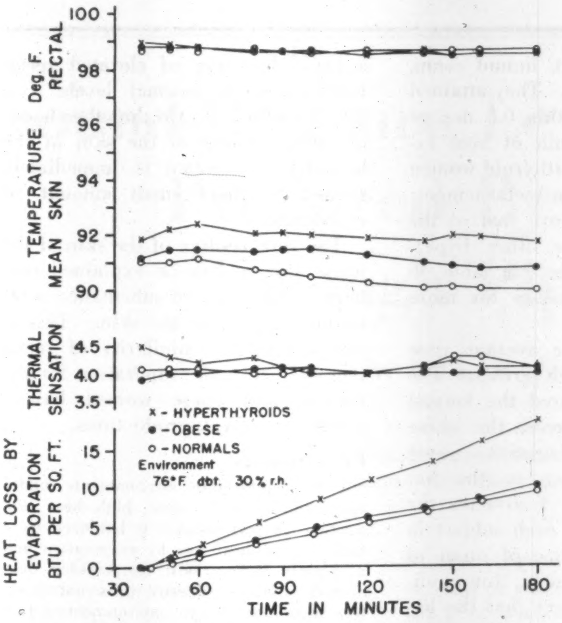

Fig. 1—The mean skin temperature, the rectal temperature, thermal sensation, and heat loss by evaporation in hyperthyroid, obese, and normal women during a three-hour exposure at 76 F, 30 percent RH

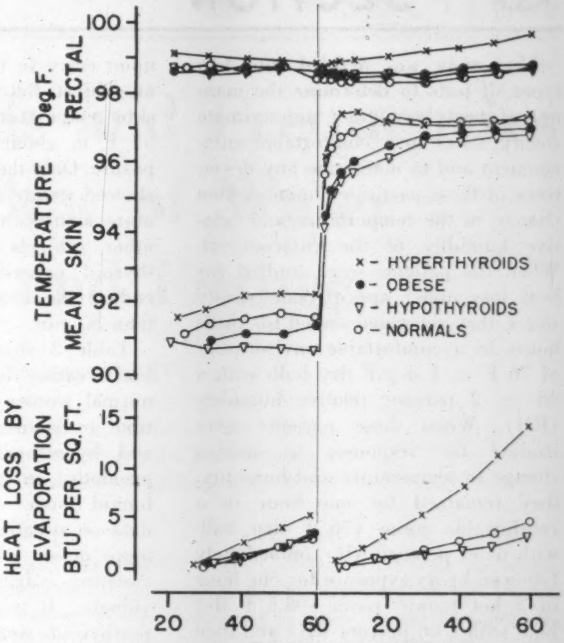

Fig. 2—The mean skin temperature, the rectal temperature, and the heat loss by evaporation in hyperthyroid, obese, normal, and hypothyroid women on entering a hot humid room (98.5 F, 66 percent RH) from a comfortable room (76 F, 30 percent RH)

Table 5—Group Averages of Mean Skin (*MT_s*), Rectal Temperature (*T_r*), Heat Loss by Evaporation and Thermal Sensation (*TS*) for Each Group of Subjects, First in the Hot Humid Room and Then After Re-entry into the Comfortable Room.

Observations	Subject Classification			
	Normal (7)*	Hyperthyroid (5)	Hypothyroid (4)	Obese (8)
HOT HUMID ROOM				
98.5 F, 66 percent RH				
After 60 min				
MT_s (F)	97.2	97.3	96.8	96.9
T_r (F)	98.7	99.7^a	98.7	98.8
TS	6.7	6.9	6.9	6.9
COMFORTABLE ROOM				
76 F, 30 percent RH				
At Entrance				
Accumulated Sweat (oz/sq ft)	0.23	0.22	0.07^a	0.12^a
TS	2.1	2.6	1.5	1.4^a
After 10 min				
MT_s (F)	90.8	90.6	92.1	91.8
T_r (F)	99.0	99.8^a	98.8	99.0
Change in MT_s in 10 min	−6.4	−6.7	-4.7^a	-5.1^a
Change in T_r in 10 min	+0.3	+0.1	+0.1	+0.2
After 60 min				
MT_s (F)	90.2	90.2	91.3	91.1
T_r (F)	98.6	98.8	98.6	98.7
TS	3.9	4.1	3.2	4.1
Heat Loss by Evaporation In one Hour				
Btu/(hr) (sq ft)	13.6	18.4^b	7.6^a	12.5

[a] Indicates significant difference of this group average from the normal.
[b] Indicates strongly suggestive difference of this group average from the normal.
* Number of subjects in group.

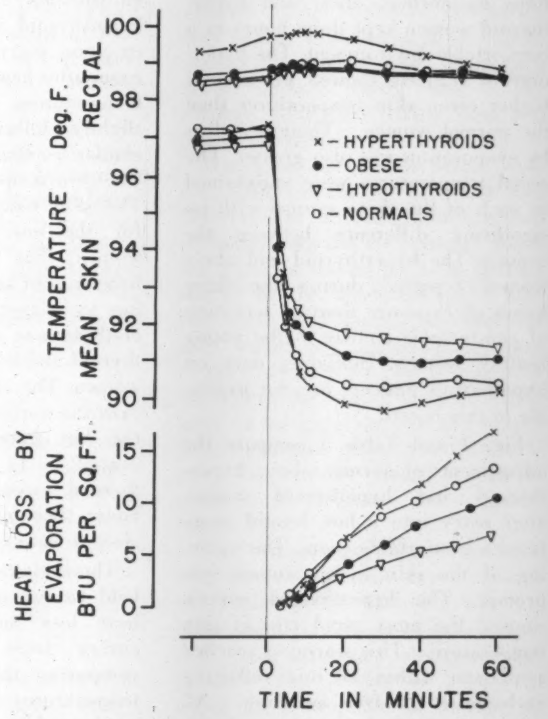

Fig. 3—The mean skin temperature, the rectal temperature, and the heat loss by evaporation in hyperthyroid, obese, normal, and hypothyroid women on entering a comfortable room (76 F, 30 percent RH) from a hot humid room (98.5 F, 66 percent RH)

The study was divided into two types of tests to determine the manner of heat loss under approximate *steady states* in a comfortable environment and to determine any deviations of these partitions upon sudden change in the temperature and relative humidity of the environment. When the patients were studied for heat loss under approximate *steady states*, they remained seated for three hours in a comfortable environment of 76 F ± 1 deg F dry bulb with a 30 ± 2 percent relative humidity (RH). When these patients were studied for responses to sudden change in temperature and humidity, they remained for one hour in a comfortable room (76 F dry bulb with a 30 percent RH) immediately followed by an exposure for one hour in a hot humid room (98.5 F dry bulb with a 66 percent RH) and then returned to the comfortable room for another hour.

Results

Fig. 1 and Table 2 present observations on normal, obese and hyperthyroid women kept three hours in a comfortable environment. The hyperthyroid subjects showed persistently higher mean skin temperatures than the normal women. Their heat loss by evaporation was also greater. The rectal temperatures were maintained in each of the three groups with no significant difference between the groups. The hyperthyroid and obese women reported during the three hours of exposure thermal sensation of *comfortable* similar to the young healthy women. Sufficient data on hypothyroid patients are not available in this regard.

Fig. 2 and Table 3 compare the adjustments of normal, obese, hyperthyroid and hypothyroid women after entry into a hot, humid room from a comfortable room. The warming of the skin in all women was prompt. The hyperthyroid women showed the most rapid rise in skin temperature. This warming reached a plateau within 10 min reflecting early onset of free sweating. All subjects raised their skin temperatures about 5 deg in 10 min after entering the hot room. Immediately upon entry to the hot, humid room, all subjects felt warm. They attained skin temperatures within 0.5 deg of 97 F in about 30 min of heat exposure. Only the hyperthyroid women showed steady rises in rectal temperature significantly above that of the other subjects. Five other hyperthyroid patients were not able to endure the heat exposure for more than 30 min.

Table 3 shows the average time for sweating for each group. The normal women required the longest time to sweat; whereas, the obese and hyperthyroids began to sweat promptly on entrance to the hot humid room. Table 4 presents the data on sweating for each subject in more detail. The time of onset of sweating varied widely for individuals. It is apparent that the hyperthyroid women sweat the most, and the hypothyroid sweat the least. The profuse sweating of the hyperthyroids is reflected in their high rate of evaporation, shown in Fig. 2.

Fig. 3 and Table 5 summarize the adjustments of the normal, obese, hyperthyroid and hypothyroid women upon entry into the comfortable room after heat exposure. The rectal temperatures of all subjects rose slightly, followed by a decline to similar levels by the end of one hour. The skin temperatures fell promptly. The skin temperatures were similar for the normal and hyperthyroid women; they were the same for the hypothyroid and obese women. Cooling by evaporation of sweat in the clothing was greatest for the hyperthyroid and least for the hypothyroid women. The obese women felt cooler than the normal women upon leaving the hot humid room. There appeared to be no difference in the thermal sensations by the end of the hour; they felt comfortable or very close to comfortable.

The evaporation of sweat has been held to explain the adjustments of heat loss mechanisms during recovery from heat exposures. In comparing the similarities of skin temperatures of the normal and hyperthyroid women it becomes apparent that the greater evaporation in the latter subjects is accompanied by a rapid lowering of elevated rectal temperature to normal levels, *i.e.*, 99.7 F to 98.8 F. On the other hand, the slow cooling of the skin of the hypothyroid women is immediately related to their small amount of evaporation.

The slow cooling of the skin of the obese women can be explained perhaps by the warmed subcutaneous fat supplying heat to the skin. This is justified by the similarity of rectal temperatures and evaporation for the normal and obese women having comparable heat productions.

Conclusions

1. In comfortable environments under approximate *steady state*, high heat production (hyperthyroids) is balanced by a high rate of heat loss by evaporation and a slightly higher skin temperature than normal women. Obesity does not interfere with heat loss in environments which are comfortable for young healthy women.
2. The physiological adjustments of hyperthyroid, hypothyroid, obese and healthy young women to sudden warming during exposure to a hot humid environment are made promptly despite handicaps in heat regulation. Obese and hyperthyroid women sweat readily. All hyperthyroids, however, are not able to endure long exposures to heat. Their heat production exceeds their heat loss, evidenced by a significant rise in rectal temperatures.
3. The physiological adjustments of hyperthyroid, hypothyroid, obese and healthy young women to sudden cooling after heat exposure depend greatly upon the evaporation of sweat collected in the clothing and upon the temperature of the body (heat content). The cooling of the skin is exaggerated by increasing the rate of cooling by evaporation, *i.e.*, the quantity of sweat trapped in the clothing. Cooling by evaporation is increased by high body temperatures. The presence of large amounts of subcutaneous fat slows skin cooling during recovery from heat exposure.

References

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Sound-Pressure Levels and Frequencies Produced By Flow of Water Through Pipe and Fittings

By W. L. Rogers*, Evanston, Ill.

This paper is the result of research sponsored by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS in cooperation with Northwestern University, Evanston, Ill.

THE INITIAL report in 1953 concerning this project outlined the experimental apparatus and methods of measurement being used[1]. In the present report, the first series of quantitative measurements and results are presented. The primary objective is to compare various pipe lengths and pipe fittings as noise sources at various velocities of water flow. Representative noise amplitudes and frequencies have been determined by means of a microphone mounted through the pipe wall and in contact with the flowing water. Measurements reported in this paper have been restricted to 1-in. pipe size and cold water of 37 F to 60 F. A limited amount of testing has been done at higher temperatures and also with larger size pipe, but these data will not be reported until a more complete understanding of the effects of these variables has been developed.

SUMMARY—This report is the second of a series concerned with the problems of noise generation and transmission in water piping and heating systems. Straight-pipe runs, orifices, elbows, gate valves, and globe valves have been investigated over a range of velocities and compared as sources of noise. Magnitudes of over-all sound-pressure levels and the levels in octave bands of frequencies have been determined in the flowing water by means of a microphone mounted through a hole in the pipe wall. Resulting characteristic magnitudes and trends are presented graphically. Measurements have been restricted to 1-in. pipe size, cold water, and pipe or fitting inlet pressure of 25 psig except as noted. Work in progress will extend the measurements to include other pipe sizes and higher temperatures.

In the consideration of any noise problem, items of primary concern are the sources and the transmission of noise. It was desirable to investigate the noise sources first, and this report represents the first step in this study. The sound-pressure levels presented are those existing *inside* the pipe, and represent *potential* airborne sound and structural vibration. The factors affecting the coupling of the vibrations which constitute sound in the liquid to the pipe wall and to the air are not a part of this report.

Experimental Set-up and Instrumentation

A tank 4 ft in diameter and 8 ft high serves as a water-supply reservoir. Steam may be admitted to the water in the tank to produce desired temperatures. In operation, the tank is not completely filled as air under pressure is admitted to the space above the water to produce desired pressures and flow rates. The water leaving the tank flows through 3-in. and 1½-in. piping to the test region. Rubber hose connects the supply pipe to the test length of pipe, which is supported by rubber loops spaced at random. The test pipe discharges into rubber hose, through an experimental acoustic absorber, through a globe control valve, and finally through additional rubber hose and piping to drain.

Operation involves a batch process, with control of pressures and flow rates in the test section achieved by controlling the air pressure above the water in the supply tank and the setting of the discharge globe control valve. No pumps are used, as they would add objectionable noise to the system. Flow rate is measured by timing the rate of drop of water level in the gage glass on the supply tank. Pressure gages and thermometers are suitably placed for measurement of pressures and temperatures.

The instrumentation used in these tests for noise measurements consists of a microphone having a flat circular metal diaphragm ⅝-in. in diameter, plus associated electronic apparatus. The section of pipe into which the microphone is mounted is flattened slightly so that the microphone face is flush with the inside of the pipe wall. Before mounting the

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[1] Experimental Approaches to the Study of Noise and Noise Transmission in Piping Systems, by W. L. Rogers (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, July 1953, p. 139).

Presented at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Swampscott, Mass., June 1954.

microphone, a coating of silicone oil is applied to the face, a thin rubber membrane is stretched across it, and then the assembly is placed and held in the mounting hole. The membrane protects the microphone from the flowing water, and the oil is used to insure good contact of the rubber with the microphone face, without air pockets.

Connected to the microphone are suitable amplifiers, an electronic voltmeter, and a frequency analyzer. Because the noises generated by flow have been found, in general, to be broad-band in character, it was decided that an octave-band analyzer should be used. This analyzer divides the frequency spectrum of 20 to 10,000 cycles per sec into 8 bands of frequencies as shown on the accompanying diagrams, and measures the level of each band. Adequate frequency information can be obtained with this type of analyzer in a relatively short time. There *have* been a few instances in which definite notes or tones have been heard through the headphones used to monitor the noise while recording data, but such instances have been rare to date.

Test Set-ups Used in the Current Tests

Fig. 1 in sections A, B, C and D shows the microphone locations and the lengths of 1-in. standard pipe used in the series of runs on straight pipe. The supply line to the left of the test pipe was soft rubber hose, and the discharge to the right consisted of soft rubber hose, an acoustic absorber, and a globe valve for controlling the flow rate, as previously mentioned. In spite of the considerable length of discharge rubber hose, it was found that additional attenuation of noise created by the control valve was required. It was therefore necessary to add an absorber. It is expected that future reports will deal with the evaluation of this type of experimental absorber and other control procedures.

At pipe-to-pipe and pipe-to-hose connections, precautions were taken to avoid appreciable and sudden changes in area in order to minimize unwanted background flow noise.

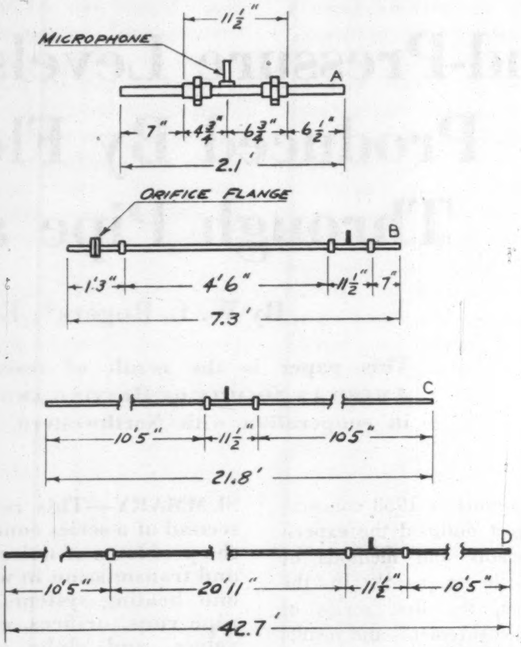


Fig. 1—Microphone locations in the four test lengths of standard 1-inch straight pipe

In comparing valves and fittings, it was necessary to hold pipe length constant so that this variable was eliminated. Arrangement B, Fig. 1 was used for this series of tests, with the fitting under test occupying the position of the orifice flange shown.

Practically all of the results presented were obtained with a pressure of 25 psig at the inlet to the test section. Occasionally runs were made with this pressure at 10 psig or some other pressure, and no significant differences in results were noted. A few of these points have been marked on the graphs. Runs were made with the microphone both upstream and downstream from the test components and, again, no significant differences were observed.

The primary variable against which noise levels have been plotted in this series of tests is velocity in standard 1-in. pipe, with pressure at inlet to the test section held constant (or having little effect), and temperature held to a relatively narrow range (37 F to 60 F). Flow was turbulent in all runs. During each run, sound-pressure level and octave-band frequency analysis were determined.

Decibel Unit of Sound-Pressure Level

The decibel unit used in this report to indicate sound-pressure level is defined in *American Standard Acoustical Terminology* Z24.1 - 1951 as

$$\text{db} = 20 \log_{10} (p/p_o)$$

where p is the actual sound pressure of interest and p_o is an arbitrary reference value. Two values of p_o are in common use. One is $(2)\ (10^{-4})$ microbar, which is in general use for measurements made in air and for some measurements made in liquids. The other is 1 microbar, which has gained wide usage for calibrations and for many types of sound-level measurements in liquids. The latter reference level has been used here so that, specifically, the decibel unit used is defined as

$$\text{db} = 20 \log_{10} p$$

where p must be measured in microbars (one microbar is one dyne per

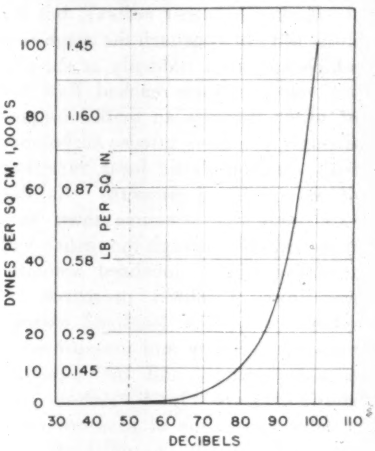


Fig. 2—Sound-pressure levels in decibels referred to 1 dyne/cm², and corresponding sound pressures

square centimeter, or about one-millionth of an atmosphere). To convert from a decibel based on one reference level to a decibel based on the other is a simple matter. It is only necessary to add 74 to the db levels given in this report, and the result will be the db based on a reference level of (2) (10^{-4}) microbar.

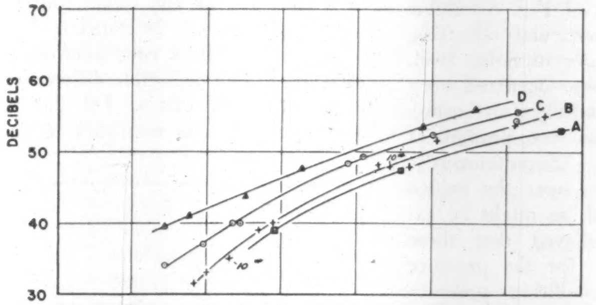
The use of a logarithmic unit in acoustic work is advantageous because of the great range of pressures ordinarily encountered, and also because it has been found that 1 db represents, roughly, the minimum change in an existing sound level that will be noticeable to average people. Fig. 2 includes the approximate decibel range covered in this report together with the corresponding sound pressures expressed in microbars (dynes per sq cm), and in psi. The db range from 30 to 90 involves a pressure range from 0.00046 psi to 0.46 psi, or a pressure ratio of 1000 to 1. Equal *changes* in decibels represent equal *ratios* of sound pressures. It is evident that decibel values cannot be added arithmetically.

Noise Produced by Flow of Water in Straight Pipe

Fig. 3 gives the measured sound-pressure levels as functions of velocity of water in 1-inch pipe for the four different straight lengths of pipe, A, B, C, and D indicated in Fig. 1. The curves show that noise is increased as velocity is increased and also as pipe length is increased. The curves tend to flatten at the higher velocities, indicating that velocity changes affect the sound pressure levels less at high velocities than at low ones.

Fig. 4 was plotted from the smoothed curves of Fig. 3. One trend indicated by this derived set of curves is that an increase in length of a pipe already long has less effect in producing additional noise than the same length increase to a short length. Also, it appears that if the velocity of water in the pipe is high, the noise level produced is not so sensitive to changes in pipe length as if velocity is low. This is particularly true for the shorter pipe lengths. The curves indicate that for very long pipes, the noise produced tends to become independent of length at any constant velocity.

Fig. 5 shows representative frequency spectra obtained by octave-band analyses of noise produced by



The symbols A, B, C, and D refer to the test lengths indicated in Fig. 1. Two check points are shown for which inlet pressure was 10 psig. For all other points, inlet pressure was 25 psig

Fig. 3—Sound-pressure levels produced by flow of water at various velocities in straight pipe

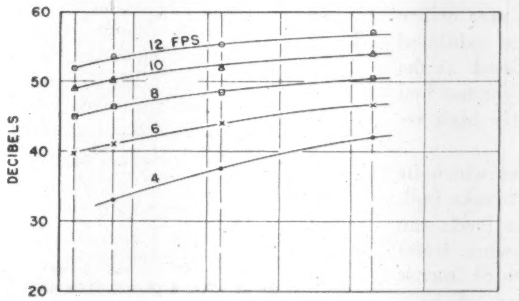
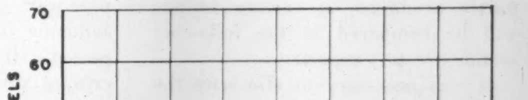


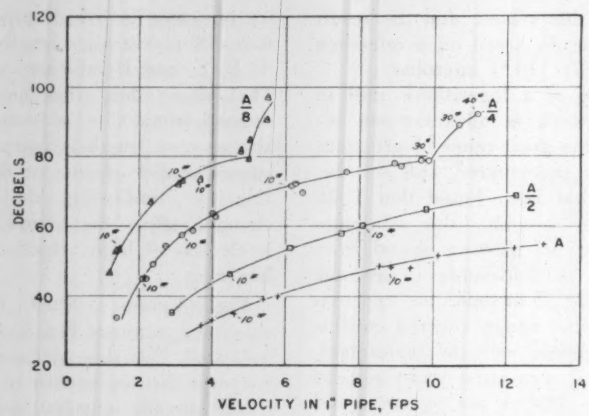
Fig. 4—The effect of pipe length upon total noise generated by flow in 1-inch straight pipe at various velocities



The symbols B, C, and D refer to the test lengths indicated in Fig. 1, and the numbers along the curves are flow velocities in fps

Fig. 5—Representative frequencies produced by flow in straight pipe

JOURNAL SECTION



Inlet pressure was 25 psig except in those runs for which the pressure is marked 10, 30, and 40. The symbol "A" represents the cross-sectional flow area of the pipe test set-up B with no orifice

Fig. 6—Sound-pressure levels produced by flow through orifices of different sizes

flow in the three straight-pipe arrangements B, C, and D of Fig. 1. For the upper three *curves*, flow velocities were 10.15, 10.05, and 9.8 fps; for the lower three velocities were 5.4, 4.9, and 5.05 fps. Probably the important items to be noticed are the general similarity of the frequency patterns of all three lengths and the fact that the predominant frequencies which largely make up the total level lie in the low-frequency bands.

These sets of curves for straight pipe represent patterns with which noises produced by various fittings will be compared in the following sections of this report.

It was necessary to eliminate the variable of pipe length when testing the various fittings and, for convenience, the basic test set-up shown in diagram B in Fig. 1 was employed for all of the following tests. The fitting under test occupied the position of the orifice flange.

Noise Produced by Flow Through Orifices

In Fig. 6 are plotted the results of tests on four circular orifices. The largest had an area equal to the inside area of 1-in. pipe, and therefore the lowest curve of Fig. 6 is merely a straight-pipe run with no orifice at all. It corresponds to the run marked B in Fig. 3. The other three orifices had flow areas of ½, ¼, and ⅛ of the cross-sectional area of the 1-in. pipe, and the curves of Fig. 6 are marked accordingly.

It is immediately apparent that orifices are potent sound sources, and that the sound-pressure levels produced can be extremely high. The two upper curves of Fig. 6 exhibit sharp breaks at particular velocities, with abrupt changes in noise level. At the breaks, there occurred very sudden intense audible (air-borne) hissing which was not present at lower velocities. Simultaneously, pipe-wall vibration near the orifice suddenly increased, as might be expected. It is believed that these *critical* velocities (for the pressure and temperature conditions present) marked the onset of intense and rather large-scale cavitation. Presumably the curve for the ½-area orifice (A/2 curve) would have exhibited the same characteristic break as the ¼ and ⅛ area orifices if the test had been carried to sufficiently high velocities.

The parts of the curves which lie on the left of the sharp breaks indicate that very high noise levels can be produced in the flowing water even without the presence of intense audible (air-borne) noise. A relatively small amount of audible (air-borne) noise *was* present at some of these lower flow-rates (although easily masked by other noises), but this noise did not approach the magnitude which appeared suddenly as the *critical* velocities were reached. Fast flow of water through an orifice unquestionably produces intense turbulence, with resulting large local variations of velocity and pressure. As flow rate increases, pressure must drop more rapidly through the orifice with resulting higher localized velocities and lower localized pressures. In other words, the localized extreme values of velocity and pressure cover a wider range, and the measured sound-pressure level reflects the greater magnitude of pressure variations. Eventually, a sufficiently low pressure can exist so that rapid release of vapor (or gas and vapor) bubbles, and the collapse of these bubbles as they move into regions of lower velocity and higher pressure, can cause a very sudden rise in the magnitudes of the pressure fluctuations constituting sound. These remarks at least present a reasonable explanation which is compatible with the experimental observations.

Although the *standard* inlet pressure used for all the tests reported was 25 psig, it will be noted in Fig. 6 that several check runs were made at 10 psig, with negligible differences in resulting db values. For the ¼ area orifice, it was necessary to use

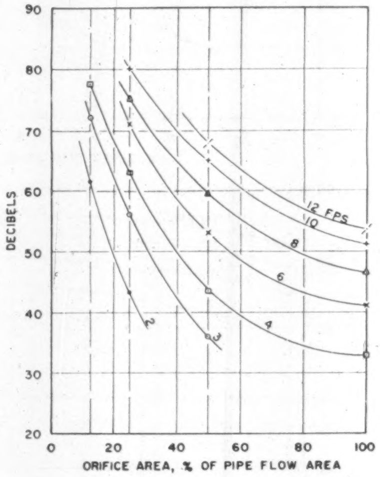
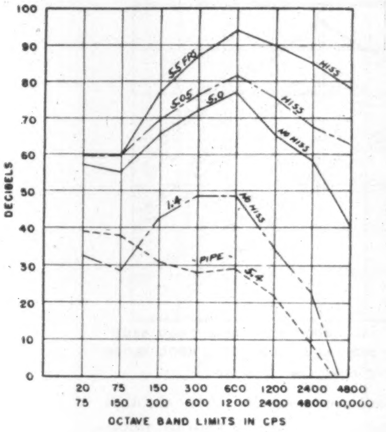
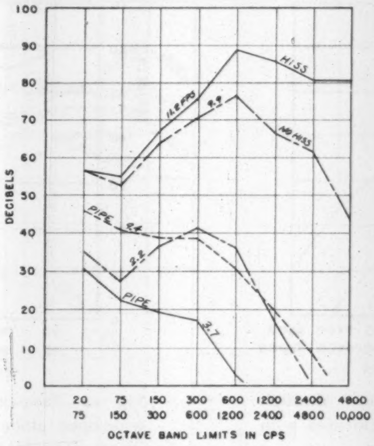


Fig. 7—The effect of orifice area upon noise generation for various velocities of approach in 1-inch pipe



Numbers on the curves represent velocities in the approach pipe in fps. The lowest short-dashed curve is for straight pipe only, without orifice

Fig. 8—Frequencies produced by flow through an orifice having ⅛ of the flow area of the pipe



Numbers on the curves are velocities in the approach pipe in fps. The curves marked "pipe" are for straight pipe only, without orifice

Fig. 9—Frequencies produced by flow through an orifice having ¼ of the flow area of the pipe

higher inlet pressures (30 psig and 40 psig) to attain sufficient velocity to produce the sharp break in the curve attributed to cavitation. At these pressures the data also fit the pattern established by the 25 psig runs. It should not be implied that pressure is a variable which can be neglected. For cold-water tests, the pressure used apparently makes little difference because the water is far removed from a boiling condition. For hot water, it might be anticipated that pressure would become a more significant variable.

Fig. 7, plotted from data derived from the curves of Fig. 6, allows interpolation for orifice sizes between those that were tested experimentally. It is probably reasonable to expect that the general patterns indicated might be duplicated in pipe sizes other than the 1-inch size tested, but this assumption has not yet been checked. It should be noted that Fig. 7 utilizes only the data from Fig. 6 which lie to the *left* of the sharp breaks in the curves.

Figs. 8 and 9 present octave-band frequency analyses of noises produced by the ⅛ area and ¼ area orifices, respectively. In Fig. 8, the top curve represents the highest point on the A/8 curve of Fig. 6. The predominance of relatively high frequencies should be noted. The second and third curves from the top are for points immediately after and before the sharp break of Fig. 6. The velocities are very little different (5.05 fps and 5.0 fps), but intense audible hiss had developed at the higher velocity which was not present for the lower one. The higher-frequency levels, especially those in the 4800-10,000 cps band, increased proportionately more than those in the lower frequency ranges when the hiss developed. For comparison purposes, the lowest curve of Fig. 8 (viewed in the 300-600 band) is plotted for a straight-pipe run with flow velocity of 5.4 fps. This velocity corresponds roughly with the velocities of the three uppermost curves already discussed. It is apparent that the straight-pipe noise is negligible by comparison with the orifice noise. The remaining curve of Fig. 8 is for a low velocity run of 1.4 fps, with the ⅛ area orifice in place.

It is apparent that as velocity through an orifice is increased, the total noise produced contains greater percentages of the higher frequencies. This seems reasonable. At higher rates of pressure drop across an orifice, it might be expected that pressure variations would occur at a more rapid rate.

Fig. 9, for the ¼ area orifice, shows the same general trends exhibited in Fig. 8. The top curve represents the highest point on the ¼ area curve of Fig. 6. Intense audible hissing was present. The second curve from the top, at 9.9 fps, represents the point immediately before the sudden break upward (Fig. 6). For this run, and also for that marked 2.2 fps (Fig. 9), audible hissing was absent. To be noted again is the rise in importance of the higher frequencies. For comparison purposes, runs at two different velocities in straight pipe without the orifice have been

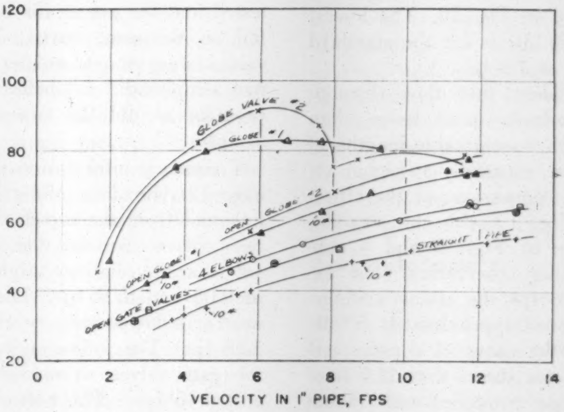


Fig. 10—Sound-pressure levels produced by flow through globe valves controlling flow, globe and gate valves wide open, and four elbows and straight pipe

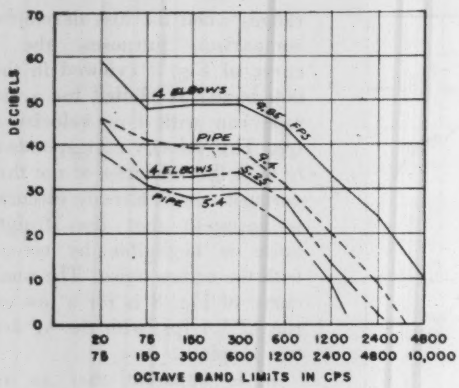


Fig. 11—Frequencies produced by flow through four elbows are compared at two velocities with those produced by flow in straight pipe

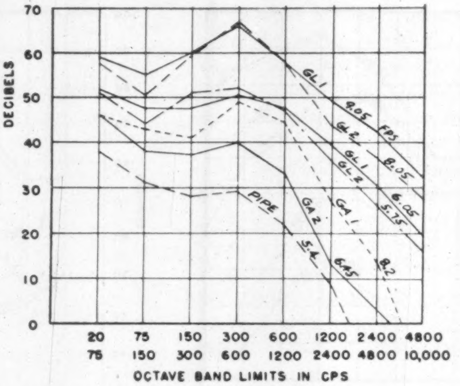


Fig. 12—Frequencies produced by flow through wide-open globe and gate valves at various velocities.* The lowest curve is for straight-pipe only

plotted. It is evident that the straight-pipe noise is of relatively little importance.

Noise Produced by Flow Through Valves and Elbows

Fig. 10 presents measured sound-pressure levels for flow through elbows, wide-open globe and gate valves, and globe valves controlling flow. These items will be discussed separately.

Elbows: Four elbows were arranged to form a U-shape with two-foot sides and bottom. This arrangement replaced the orifice flange shown in Fig. 1 (diagram B), resulting in an increase in the total pipe length of the test set-up from 7.3 to 13.3 ft. Flow was started and the measured noise levels resulting are depicted in Fig. 10. The lowest curve in Fig. 10 is for the standard test length of 7.3 ft.

It is evident that flow through elbows produces more noise than flow through considerable lengths of straight pipe, especially at higher velocities. A comparison of the elbow curve of Fig. 10 with the straight-pipe curves of Figs. 3 and 4 substantiates this observation. For example, at 6 fps the elbow arrangement produced approximately 50 db. In Fig. 4, the curve of constant velocity of 6 fps shows that 42.7 ft of straight pipe produced only about 47 db, and that additional length is less effective in producing additional noise.

The relative contribution of each of the four elbows to the total noise is not known. The problem of how to add properly the noises produced by multiple sources to determine a total noise level has been left to future consideration.

Fig. 11 shows representative frequencies for two velocities in elbows and, for comparison, two roughly corresponding velocities in straight pipe of length 7.3 ft (diagram B of Fig. 1). The frequency distributions are all quite similar.

Wide-Open Gate and Globe Valves: Fig. 10 shows the results of runs with wide-open settings of two samples each of gate and globe valves, selected at random. The gate valves were quieter than the four elbows tested and the points for both valves fall on the same curve. The globe valves were much noisier, and the two samples did not behave as nearly alike as did the two gate valve samples.

Frequency information is given in Fig. 12. Reading along the 20-75 line and from the top down, the top two curves are for the two globe valves at the relatively high velocities of 9.05 and 8.05 fps. The next two are for a lower velocity of 6.05 and 5.75 fps. The following two are for the gate valves, at velocities of 8.2 and 6.45 fps. The bottom curve is a basic straight-pipe run at a velocity of 5.4 fps. There is a tendency for the higher frequencies to be of more importance in the globe-valve runs than in the gate-valve runs. As with orifices, the greater pressure drop required across the globe to produce a given flow rate probably results in more rapid pressure fluctuations.

Globe Valves Controlling Flow: The top two curves in Fig. 10 show that the two valve samples tested produced quite different noise patterns. The curve for valve No. 2 exhibits a sharp break, and there appeared sudden intense audible hissing, along with the abrupt increase in decibels shown, as the valve was closed to throttle the flow. The characteristics observed were much like those of the orifices already discussed, including the maximum decibel values observed. The other valve (No. 1) developed an audible hiss gradually as the valve was closed, and did not exhibit the sudden and abrupt change of valve No. 2.

No detailed explanation of these differences in behavior will be attempted here. It is evident that the flow patterns inside the valves must have been somewhat different. Possibly one valve (probably No. 1) produced the total pressure drop with less abruptness than the other. The valves were not made by the same manufacturer, and valve No. 1 appeared to have been refaced many

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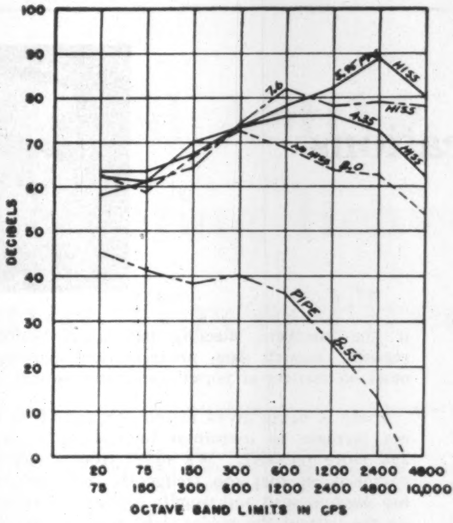
*GL = globe valve; GA = gate valve.



Velocities in the approach pipe appear along the curves. The lowest curve is for straight pipe only

Fig. 13—Frequencies produced by flow through globe valve No. 2 used to control the flow

more times than No. 2. The fit of parts seemed to be somewhat looser in No. 1 also.

Fig. 10 indicates that the magnitude of sound-pressure level produced by globe valves controlling flow reaches a maximum (with constant inlet pressure), and this can easily be observed by listening as a valve is gradually closed from a wide open position. At flow rates higher than those at the maximum sound-pressure level, there is less pressure drop produced by the valve but a greater quantity of water involved. At flow rates below those at the maximum, there is greater pressure drop through the valve but a smaller quantity of water involved. These two items — the magnitude of pressure drop, and the quantity of water involved in the resulting flow pattern — need further study.

The frequency characteristics of globe valve No. 2 are shown in Fig. 13 along with a straight-pipe run at a velocity of 8.55 fps (lowest curve). For the valve curve at 8.0 fps, there was no audible hiss, while with the valve closed slightly to reduce the velocity, the hiss began. The hiss was steady at a velocity of 7.6 fps, reached a maximum at 5.95 fps, and decreased as the valve was throttled further to produce lower velocities. As with the orifices, a rise in importance of the higher frequencies occurred as audible hiss developed.

For valve No. 1, the distribution of frequencies was somewhat similar to that plotted for No. 2 in Fig. 13. However, as hissing began, the higher frequencies were gradually apparent without the abruptness of valve No. 2.

Occasionally during the experimentation it was possible to find a flow rate for a flow-controlling valve which suddenly produced severe vibration of the valve, with accompanying definite tones and overtones. These could be heard by an observer in the test room, as well as through the headphones used for monitoring the microphone pickup. Such occurrences were relatively rare, and very slight changes in valve setting caused the phenomena to disappear. A possible explanation is the presence of a self-excited vibration because of looseness in the valve parts, in conjunction, perhaps, with a pipe of proper length to cause augmentation of the particular frequencies produced. With these few exceptions, flow noises were found not to consist of discrete frequencies, but to be rather broad-band in character.

Conclusion

Characteristic patterns and quantitative measurements have been determined for sound-pressure levels and frequencies produced in the water inside pipes by flow through representative piping components. The measurements indicate that elbows, valves, and orifices are all much more potent noise sources than straight runs of pipe.

The values presented are averaged readings, with fluctuations within the time intervals of reading sometimes amounting to several decibels. The plotted curves were spot checked occasionally, with reproducibility usually within 1 or 2 db. The tests are for cold water in the temperature range 37 F to 60 F, with 25 psig inlet pressure to the component under test (unless otherwise noted on the curves), and for 1-in. standard pipe size only.

Work in progress will extend the information to cover other pipe sizes and higher temperatures over the same flow velocity range. It is hoped that the data for different pipe sizes and different temperatures can be correlated in such a manner that results can be presented in compact form. Noises produced by pumps are to be evaluated, also.

After a sufficient background of information on noise sources has been developed, the problems of how to add the effects of these sources to determine total noise levels, the transmission of these noises to the pipe wall and to the air, possibilities of reducing the magnitudes of the sources, and evaluation of methods of attenuation will be studied. Many of these items have already necessarily received some attention during the operation of this project, but they will be given more intensive study as the project continues.

Acknowledgment

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JOURNAL SECTION

ASHVE Publications

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The JOURNAL of the Society has been incorporated in *Heating, Piping & Air Conditioning* for 25 years under a contract between the Society and Keeney Publishing Co. It contains reports on most Society activities and presents to the members, meeting papers, discussions, committee reports, research data, programs and activities, as well as news on matters of popular and professional interest.

Study is being given to our JOURNAL to see if we cannot increase its usefulness by making it more interesting and more *readable*. We suffer from a common failing of engineers in that too frequently our technical papers are *too hard* to read and usually require intensive concentration on the part of the reader if he is to absorb the findings set forth in the paper. Consequently, unless a reader is intensely interested in the subject of the paper he is likely to set it aside to read at some future date, when he has *more time* or possibly is not quite so fatigued. Of course, we all know that time seldom comes. It would be ideal to make the article so easy to read that it would be read as a diversion as well as for information, and the findings would be presented in a form that could be readily absorbed and remembered. We will probably have to be satisfied with a compromise between the ideal and the highly technical presentation.

If the recommendations of authorities in the publication field who have become experts on the manner in which technical material should best be presented are sound, then there are possibilities for considerable improvement in many technical papers. Unfortunately, some authors are sensitive about any suggestions for improvements in their papers even though such are not intended as a reflection on their technical ability.

The editors of many of our most successful publications have very firm policies regarding the form of presentation of material in their magazines and accept papers only from authors who adhere to their rigid requirements.

One possibility that has considerable merit is to publish in TRANSACTIONS the technical papers as written and in the JOURNAL publish a condensed version giving conclusions and important facts written in much less technical form.

Our publications have great educational value, but if we are to fulfill our purpose to serve the public to the fullest extent we must see that the information contained in our publications is disseminated as widely and quickly and effectively as possible.

Cordially yours,

L. N. Hunter

PRESIDENT

Proposed ASHVE Code for Testing and Rating Heavy Duty Furnaces and Direct-Fired Unit Heaters[†]

The need for a Code for Testing and Rating Heavy Duty Furnaces was brought to the attention of the ASHVE Council in November 1942 by E. K. Campbell. An Advisory Committee appointed for the purpose of investigating the matter recommended that a committee be appointed to prepare an ASHVE Code for Testing and Rating Heavy Duty Furnaces.

Upon authorization by the Council, the ASHVE Standards Committee appointed the following Code Committee on December 18, 1943: E. K. Campbell, Chairman, H. D. Campbell, A. P. Kratz, W. J. MaGirl, A. A. Olson, B. B. Reilly, H. J. Rose and H. A. Soper. As work proceeded, the Committee was enlarged and there were some changes in personnel. The scope was enlarged to include direct-fired unit heaters having output ratings exceeding 250,000 Btu per hour.

When the code was completed in 1953, the Council approved printing of the code in the ASHVE Journal as a Proposed Code, to allow 60 days for receipt of criticism after which the Code Committee will meet to consider desirable changes which should be made before the code is prepared in final form for Society approval. Comments are invited, and should be sent to the ASHVE Standards Committee, 62 Worth St., New York 13, N. Y.

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Section 1. Purpose

This code describes an apparatus and proposed procedure for testing and rating heavy duty warm air furnaces and direct-fired unit heaters.

Section 2. Scope

The code is applicable to forced warm air furnaces and direct-fired unit heaters having output ratings in excess of 250,000 Btu per hr.

Section 3. Definitions

3.1 A Forced Warm Air Furnace is a device whereby air, heated by combustion of a fuel, is delivered to a building through a system of ducts; the essentials of such a furnace are a casing, a heat exchanger, and fuel burning means such as grate bars or stoker for solid fuel, an oil burner or gas burner, and a fan.

3.2 A Direct-Fired Unit Heater is a forced warm air furnace that delivers warm air to the space being heated without the use of a duct system. Turning elbows, stub ducts, or deflecting vanes to direct the discharge of the warmed air are typical parts of unit heaters.

[†] This Code was prepared by the ASHVE Committee on Code for Testing and Rating Heavy Duty Furnaces: E. K. Campbell, Chairman; Bowen Campbell, R. S. Dill, A. P. Loeb, C. J. Low, W. J. MaGirl, B. F. McLouth, F. L. Meyer, L. G. Miller, A. A. Olson, H. A. Pietsch, O. J. Ress, H. A. Soper.

3.3 The Heat Exchanger consists of a combustion chamber and any auxiliary heating surface enclosed with it in the same casing.

3.4 The Combustion Chamber is that enclosure in which fuel or gaseous derivatives of fuel are burned.

3.5 Radiator or Economizer is a term often used to designate a metal enclosure within the same casing as the combustion chamber to which it is connected to form auxiliary heating surface.

3.6 Primary Heating Surface is that portion of the heat exchanger exposed to direct radiation from the fire. (The heat transfer surfaces of the combustion chamber are often called primary heating surfaces although this definition may not be exact.)

3.7 Secondary Heating Surface is that portion of the heat exchanger not exposed to direct radiation from the fire. (The surface of the radiator or other auxiliary heating surface is often called secondary heating surface although this definition may not be exact.)

3.8 The Firebox Liner is that metal or ceramic material installed near the bottom of the combustion chamber to shield it from the heat and chemical action due to primary combustion.

3.9 The Casing is that structure which encloses the heat exchanger and forms a passage around it for the air being heated. The fan is either connected to the casing or enclosed within it. In this latter condition the return air passes through the casing to reach the fan.

3.10 The Plenum is that part of the casing from which the warm air ducts receive heated air. The upper part or top of the casing is also called the bonnet.

3.11 A Radiation Shield is a metal sheet or plate supported between the heat exchanger and the casing to protect the casing from the heat radiating from the heat exchanger.

3.12 Standard Air is air with a density of 0.075 lb per cu ft. This is approximately the weight of dry air at 70 F or of air with 50 percent relative humidity at a dry bulb temperature of 68 F when the barometric pressure is 29.92 in. of mercury. The specific heat is assumed to be 0.243 Btu per lb for purposes of this code.

3.13 The Air Delivery is the rate of discharge of standard air in cubic feet per minute (cfm) from the furnace or unit heater casing outlet or outlets.

3.14 The Heat Input is the gross heating value of the fuel supplied to the furnace or unit heater expressed in Btu per hour.

3.15 The Heat Output is the heat input less the flue gas loss expressed in Btu per hour.

3.16 The Gross Output is the highest output obtained under test conditions described in **Section 5** without exceeding one or more of the rating limits stated in **Section 4.**

3.17 The Rating of a furnace or unit heater is an output equal to or less than the gross output which may be selected by the manufacturer for publication.

3.18 The Efficiency is the ratio of the output to the input expressed in percent.

3.19 The Flue Gas Loss is the heat escaping in the flue gases. It includes the sensible heat in the dry gases, the latent heat of the water vapor in the flue gases and the heating value of any unburned combustible in the flue gases.*

3.20 Steady State is defined for purpose of this code as operation of the furnace or unit heater under such conditions that the air temperature rise does not vary by more than 3 deg, and neither the fuel input rate nor the flue gas loss varies by more than 3 percent at any time during the test.

Section 4. Rating Limits

The rating limits which determine the Maximum Output are given in paragraphs **4.1** to **4.5.**

4.1 Flue gas temperature shall not exceed the inlet air temperature by more than 730 deg. It shall not be less than 300 deg above the inlet air temperature.

4.2 The heat exchanger surface temperature at any point shall not exceed the inlet air temperature by more than 930 deg if the surface is grey iron casting or low carbon steel. Higher spot temperatures are permitted when evidence is presented that the metal will withstand them. Spot temperatures for alloy and stainless steels shall not exceed a temperature which is 100 deg below the scaling temperatures shown in Table 1 unless scaling temperatures from other reliable scources are furnished by the manufacturer.

4.3 The casing surface temperature shall not exceed the inlet air temperature by more than 90 deg when the casing temperature is measured as described in **Section 5,** except at points within 6 in. of the flue outlet collar or other openings through the casing.

4.4 Carbon monoxide (CO) shall not be present in the flue gases in quantities measurable with the three-pipette Orsat apparatus required in **Section 5.**

4.5 The temperature rise of the air shall not be less than 50 deg, nor more than 85 deg. A steady state with reference to temperature rise shall prevail throughout the test. Manufacturer shall state the intended or design temperature rise in the test report.

Section 5. Testing Equipment and Method

5.1 The specimen tested shall be either the identical furnace or unit heater to which the rating is to apply or a representative sample and true duplicate of furnaces or of unit heaters regularly produced by the manufacturer.

5.2 The heat exchanger surface temperature shall be measured by means of at least 10 thermocouples attached to it at the hottest areas. The thermocouples shall be about one foot apart and may be attached by welding, brazing or peening.

5.3 Casing surface temperatures shall be measured by means of a contact thermocouple. This thermocouple shall be attached to the center of a disc of thermal insulating material not less than 3/8-in. in diameter.

5.4 Flue gas temperature shall be measured by means of a thermocouple grid placed in the flue pipe within one foot of the flue outlet collar. The grid shall consist of at least 6 thermocouples in a plane normal to the gas flow. The thermocouples shall be regularly spaced on a circle concentric with the flue pipe and having a radius of two-thirds of that of the flue pipe. There shall be no draft regulator, damper, opening, or exhaust fan between the furnace and grid during the test.

5.5 A three-pipette Orsat apparatus shall be provided for determining the proportions of carbon dioxide, oxygen, and carbon monoxide in the flue gas.

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*Note: No CO permitted in test.

It shall be connected to draw samples from the flue pipe at the plane of the thermocouple grid.

5.6 A liquid manometer or a calibrated gage shall be provided for measuring the draft. The draft shall be measured in the flue pipe, near the smoke collar, and also in the combustion chamber.

5.7 The inlet air temperature shall be measured with one or more thermocouples located in the air intake upstream from the fan.

5.8 The discharge air temperature shall be measured by means of a thermocouple grid installed in the outlet duct in a plane normal to the air flow with one thermocouple in each 36 sq in. segment of the duct area. More than 40 segments shall not be required, but where 40 segments are needed they shall be rectangles of equal area. There shall be an elbow followed by a duct having a length equivalent to at least four elbow diameters (or heights) long between the furnace and the grid to protect the thermocouples from heat exchanger radiation.

5.9 Oil fuel shall be weighed by means of a scale having a precision equal to at least one percent of the fuel burned per hour. The fuel suction line shall be suspended free from the container during the weighing operation.

Table 1—Published Scaling Temperature of Various Types of Alloy and Stainless Steels[a]

Type	Scaling Temperature
302	1600
303	1600
309	2000
310	2000
316	1650
321	1600
347	1600
410	1250
416	1250
430	1500
446	1900

[a] From **Metals Handbook,** 1948 Edition, Table VII, p. 556

Table 2—Calorific Values for Fuel Oil[a]

Degrees API at 60 F	Density, lb/gal	Btu/lb	Btu/gal
24	7.587	19,190	145,600
25	7.538	19,230	145,000
26	7.490	19,270	144,300
27	7.443	19,310	143,700
28	7.396	19,350	143,100
29	7.350	19,380	142,500
30	7.305	19,420	141,800
31	7.260	19,450	141,200
32	7.215	19,490	140,600
33	7.171	19,520	140,000
34	7.128	19,560	139,400
35	7.085	19,590	138,800
36	7.043	19,620	138,200
37	7.011	19,650	137,600
38	6.960	19,680	137,000
39	6.920	19,720	136,400
40	6.879	19,750	135,800
41	6.839	19,780	135,200
42	6.799	19,810	134,700

[a] The above figures are from *National Bureau of Standards* Miscellaneous Publication M97 (Table 6).

5.10 Oil fuel used for the test shall have a gravity of approximately 35 *API* at 60 F. See National Standard Petroleum Oil Tables, *National Bureau of Standards, Circular* 410 and *Publication* M-97.

5.11 Gas fuel shall be measured with a calibrated meter.

5.12 Fuel pressure for oil burning furnaces shall be measured ahead of the nozzle with no valve or other restriction between the nozzle and the gage connection.

5.13 Fuel pressure for gas burning furnaces shall be measured at the meter and in the burner manifold (or as near the burner orifices as practicable).

5.14 Fan speed and motor speed shall be determined with a revolution counter, a tachometer or a stroboscope.

5.15 The energy input to the fan motor shall be measured with suitable meters.

Section 6. Testing Procedure

6.1 The furnace or unit heater shall be assembled in accordance with the manufacturer's instructions and fitted with testing equipment as described in **Section 5.**

6.2 The furnace or unit heater shall be operated during a preliminary period to determine maximum firing rate and air temperature rise for its maximum output as defined in paragraph **3.16.**

6.3 The furnace or unit heater shall be operated following the preliminary period at steady state conditions for a period of at least two hours at a selected output equal to or less than its maximum output.

6.4 Data to identify the device tested shall be entered as items 1 to 6 in **Section A,** Physical Data of the Furnace or Unit Heater Test Report. Fuel data and the manufacturer's rating data shall be entered as items 7 to 10 in **Section B,** Fuel and Rating Data.

6.5 Test readings shall be recorded as items 13 to 28 in **Section C,** Test Readings.

6.6 Computations shall be made in accordance with **Section D,** Computations and Results, and entered as items 29 to 36.

Section 7. Rating Procedure

7.1 The furnace rating shall be calculated in accordance with item 35 of **Section D,** Computations and Results.

7.2 Air delivery shall be calculated in accordance with item 36 of **Section D,** Computations and Results.

7.3 The rating of the furnace or unit heater for burning solid fuel shall not exceed its rating for burning oil fuel. Tests for ratings with solid fuel are not required.

Table 3—Correction to standard *API* gravity at 60 F[a]

Observed temp of oil F	Observed gravity (degrees API)									
	24	25	26	27	28	29	30	31	32	33
50	24.6	25.6	26.6	27.6	28.7	29.7	30.7	31.7	32.7	33.7
60	24.0	25.0	26.0	27.0	28.0	29.0	30.0	31.0	32.0	33.0
70	23.4	24.4	25.4	26.4	27.3	28.3	29.3	30.3	31.3	32.3
80	22.8	23.8	24.8	25.7	26.7	27.7	28.7	29.6	30.6	31.6
90	22.2	23.2	24.2	25.1	26.1	27.1	28.0	29.0	30.0	30.9
100	21.6	22.6	23.6	24.5	25.5	26.5	27.4	28.4	29.3	30.3

Observed temp of oil F	Observed gravity (degrees API)								
	34	35	36	37	38	39	40	41	42
50	34.7	35.7	36.7	37.7	38.8	39.8	40.8	41.8	42.8
60	34.0	35.0	36.0	37.0	38.0	39.0	40.0	41.0	42.0
70	33.3	34.3	35.3	36.2	37.2	38.2	39.2	40.2	41.2
80	32.6	33.6	34.6	35.5	36.5	37.5	38.4	39.4	40.4
90	31.9	32.9	33.8	34.8	35.8	36.7	37.7	38.7	39.6
100	31.3	32.2	33.2	34.1	35.1	36.1	37.0	37.9	38.9

[a] From National Standard Petroleum Oil Tables, Circular C410 *National Bureau of Standards,* March 4, 1936.

JOURNAL SECTION

FURNACE OR UNIT HEATER TEST REPORT

Section A. Physical Data

1. Identification
1.1 Manufacturer
1.2 Model No.
2. Physical Dimensions
2.1 Heating Surface, Total sq ft
2.1.1 Combustion Chamber, Net sq ft
2.1.2 Extended Surface Affixed to Combustion Chamber sq ft
2.2 Secondary Surface sq ft

3. Combustion Chamber Volume cu ft
4. Material of Combustion Chamber
4.1 Type No.
4.2 Scaling Temperature (if published) F
5. Fuel Burning Equipment
5.1 Manufacturer
5.2 Type
5.3 Kind of Ignition System

5.4 Fuel Oil Nozzle, Make
5.4.1 Rating gph
5.4.2 Spray Angle deg
5.5 Gas Orifice
5.5.1 Number of Orifices
5.5.2 Size of Orifices
6. Fan and Motor
6.1 Name Plate Data
6.1.1 Voltage volts
6.1.2 Amperage amps
6.1.3 Horsepower hp
6.1.4 Fan or Blower Speed rpm
6.1.5 Motor Speed rpm

Section B. Fuel and Rating Data

7. Fuel Oil used for Test
7.1 Gross Heating Value Btu per gal
7.2 Gross Heating Value Btu per lb
7.3 Viscosity, Saybolt Universal secs at 100 F
7.4 *API* Gravity at 60 F
7.5 Flash Point F
7.6 Fire Point F
7.7 Ultimate Analysis % by weight
C O
H S
N

8. Gas Fuel used for Test (Kind ———)
8.1 Gross Heating Value Btu per cu ft
8.2 Specific Gravity
8.3 Ultimate CO_2 %
8.4 Ultimate Analysis % by volume
CO_2 H_2 C_2H_6
Ill. CO N_2
O_2 CH_4
9. Steady State Test
9.1 Observed Output Btu per hr

9.2 Fuel Burning Rate Btu per hr
9.3 Air Delivery cfm
9.4 Efficiency %
10. Catalog Rating
10.1 Output Btu per hr
10.2 Fuel Burning Rate Btu per hr
10.3 Air Delivery cfm
10.4 Fan or Blower Motor Power (Name Plate) hp
10.5 Motor Voltage volts
10.6 Amperage amp

Section C. Test Readings

Date of Test

11. Testing Laboratory
12. Test Observer
13. Time of Reading*
14. Oil Fuel — Scale Reading lb
15. Oil Fuel Consumption, Avg. lb/hr
16. Gas Meter Reading cu ft
17. Gas Consumption cu ft/hr
18. Pressure
18.1 Oil at Nozzle psi
18.2 Gas at Meter in.H_2O
18.3 Gas at Manifold in.H_2O

18.4 Barometric in.Hg
19. Gas Temperature at Meter F
20. Gas Consumption (corrected to 60 F & 30 in. Hg) cu ft
21. Flue Gas Analysis (by vol) %
21.1 CO_2
21.2 O_2
21.3 CO
22. Flue Gas Temperature F
23. Draft in.H_2O

23.1 Combustion Chamber
23.2 Furnace Outlet
24. Air Temperature, Fan Inlet F
25. Air Temperature, Discharge Duct F
26. Fan Motor Performance
26.1 Volts
26.2 Amperes
26.3 Energy Consumption whr
26.4 Speed rpm
27. Fan Speed rpm
28. Oil Burner Motor Energy Consumption whr

Section D. Computations and Results

29. Heat Input, H Btu/hr
Fuel Burned per hour × gross heating value
29.1 For oil H = Item **15** × Item **7.2**
29.2 For gas H = Item **20** × Item **8.1**
30. Heat Release per cu ft of Combustion Chamber Volume Btu/hr
Item **29** ÷ by Item **3.**

31. Fan Power Consumption (estimated) hp

$$\frac{\text{Item } \mathbf{10.4} \times \text{Item } \mathbf{26.1} \times \text{Item } \mathbf{26.2}}{\text{Item } \mathbf{10.5} \times \text{Item } \mathbf{10.6}}$$

32. Air Temperature Rise through Furnace deg
Item **25** — Item **24**
33. Flue Gas Loss %
Apply Items **21.1** and **22** to Fig. 1 for oil or to Fig. 2 for gas fuel

34. Efficiency %
100 — Item **33**
35. Gross Output Btu/hr
Item **29** × Item **34**
36. Air Delivery (Standard Air) cfm

$$\frac{\text{Item } \mathbf{35}}{\text{Item } \mathbf{32} \times 1.08}$$

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*Test sheet should provide space for 20 min. observations, 2-hr steady state test, and include column for total or average.

JOURNAL SECTION

FURNACE OR UNIT HEATER TEST REPORT

Section D. Computations and Results (continued)

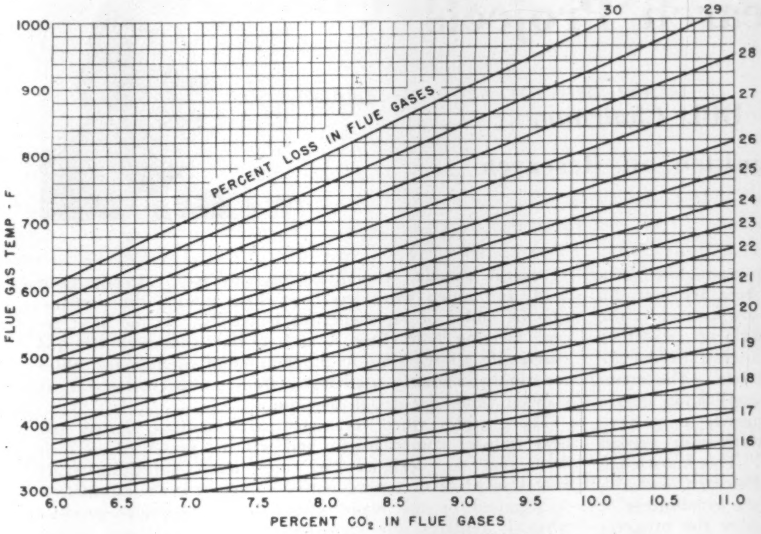

Fig. 1—Flue Gas Loss With Oil Fuel

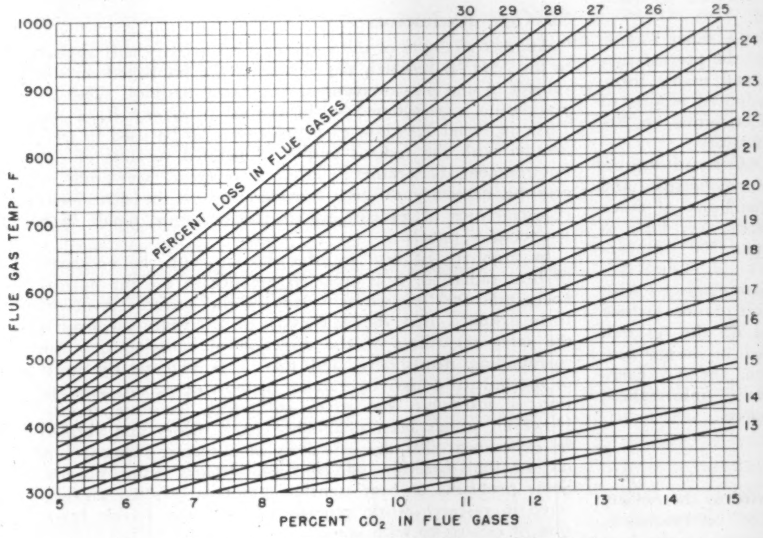

Fig. 2—Flue Gas Loss With Natural Gas Fuel

Comments, suggestions, and criticism pertaining to this Code are invited and should be mailed to:

Standards Committee
c/o ASHVE
62 Worth St.
New York 13, N.Y.

All communications received will be given careful consideration by the Committee on ASHVE Code for Testing and Rating Heavy Duty Furnaces when preparing the final draft of this Code for Society approval.

INDOOR COMFORT SHOW IN PHILADELPHIA

The National Indoor Comfort Exposition held in Philadelphia's Commercial Museum, May 16-20, 1954 afforded the public and the trade an opportunity to see the newest types of oil-fired heating equipment and allied developments. The Show was held under the auspices of the *Oil Heat Institute of America.*

There were a total of 150 exhibitors representing oil burner and accessory manufacturers, boiler and furnace makers, motor and control companies, most of the major oil companies, and publishers in the heating and air conditioning field.

There were many displays of interest including compact package heating plants, more sensitive and attractive controls and control systems, electric motors of smaller size and greater power, improved safety devices, more efficient boilers and improved nozzles, and pumps.

The ASHVE sponsored, in cooperation with the Philadelphia Chapter of the Society, a display which attracted considerable interest. Exhibits of the pyrheliometer demonstrating heat transmission characteristics of five different types of glass, and the low-inertia, low-resistance heat flow meter were shown. In addition, there was information on other research projects. A brief outline of the research on pulsation in oil burner flames and resonance in gas flames which is being undertaken at Battelle Memorial Institute under Society, *OHI*, and *AGA* sponsorship was shown.

Attention!!
Members of ASHVE
Moved or Moving?

Each month mail is returned BECAUSE you overlooked advising us of the change in your address.

The return mail is a loss to you, and an added expense to the Society.

In your own interest, will you please advise us at once of any change in your business or home address, indicating which is your mailing address.

ASHVE Headquarters
62 Worth St.
New York 13, N. Y.

TAC Research Projects

By R. S. Dill, *Chairman*
ASHVE Committee on Research

IN THE planning of Society research programs, the Technical Advisory Committees, of which there are now 20, play an essential part. These committees are formed by the Committee on Research, and consist of engineers, scientists and other specialists, who have a vital interest in the accomplishment of important research objectives. The members are constantly in contact with the application of research results in the field, and consequently they have first-hand knowledge of the type of information needed by designers and users of engineering data. This knowledge is made available to the Director of Research and the Laboratory staff in frequent meetings of the committees at the Research Laboratory in Cleveland, where the progress on committee projects is reviewed and discussed, and where the research procedure is improved or adapted to yield the information needed for later application.

The Technical Advisory Committees* have other important objectives. It is their duty to assist in the presentation of research results in the most practical and usable form. These committees therefore review the proposed reports of tests before they are submitted to the Committee on Research for approval and release for publication.

It is obvious that membership on a TAC constitutes an extremely valuable service to the Society membership, and that it involves sacrifice of time and expenditure of much effort on the part of men who are already very busy in carrying their own responsibilities. About 200 members participate in this work.

But the work of the TA Committees is not finished with the publication of reports of tests. Their duties include the preparation of the information based on the research reports in such form that it can be used in design procedures. In preparing design information, the TA Committees are not limited to any one source of information, but are free to collect material from any source.

Heat Transmission Values

A good example of the wide TAC service to the Society is found in the present program of the TAC on Insulation. This committee is engaged in a critical study of the heat transmission of insulating materials. The objective of this study is to prepare heat transfer information for representative materials now used in building construction, as well as those used for industrial insulation.

This type of information is published in THE GUIDE, and consequently the information, when compiled, will be offered to the Guide Committee for consideration.

Several two-day committee sessions have already been held, and much work has been done toward the preparation of tables of representative materials. At the most recent meeting held June 3 and 4, the committee devoted practically all the time to preparation of preliminary tables containing currently used materials and representative heat transfer values for design purpose.

These tables when completed will facilitate design and heat transfer computations, and will be presented in such form that the designer can conveniently substitute exact values in place of representative values, if such information is supplied by the manufacturer for a particular product when it replaces any representative material listed in the tables.

Surface Radiation

Another example of the value of TAC activity will appear in an ASHVE research paper soon to be published on the subject of the measurement of angular emissivity. The investigation was initiated at the request of *Group B*, of the TAC on Panel Heating, to provide data to be used in connection with the radiant output of painted surfaces of the Environment Laboratory. From a practical viewpoint it may be necessary to give consideration to the directional characteristics of radiant panels, for example, small high temperature panels.

In problems of heat transfer dealing with the exchange of heat radiation, it is common practice to use the normal (perpendicular) emissivity values of the surfaces involved. It is assumed that the emissivity of a surface element is the same regardless of the direction of emission into the surrounding hemisphere, and that it is numerically equal to the normal emissivity value. In most cases, this assumption is justifiable and gives sufficiently accurate results. However, it has been established from theory and verified by experiment that the emissivity of a surface element varies as the direction of emission departs from normal. Some problems of heat transfer, particularly those encountered in research work, require a knowledge of this variation of emissivity with angle.

Skylight Studies

From the TAC on Heat Flow Through Glass has come a suggestion that heat gain data should be obtained for fenestrations providing top lighting of buildings. A subcommittee has formulated a program of research and analysis for studies to be made this summer.

In subsequent comments on this page attention will be given to the activities and programs sponsored by other Technical Advisory Committees.

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*See p. 157 for personnel of Technical Advisory Committees.

Summary of Chapter Meetings*

SOUTHERN CALIFORNIANS HEAR SMOG DISCUSSION

Program chairman R. W. Thomas presented a panel at the May meeting, which discussed a problem of vital interest to every Los Angeles resident. *Smog — Its Causes and Effects* was the title and C. D. Walz served as moderator.

O. C. Johnson, sales manager, Water Chemists, Inc., Los Angeles, discussed the causes of smog, which he defined as any combination of air pollutants, particularly those which are irritating or visible. Inversions and their influence in causing smog were explained by Mr. Johnson. He described the accomplishments of the control program and gave figures on the amount of reduction of air pollutants being discharged into the atmosphere each day. The chief sources of the pollution, which is primarily hydro-carbon, are from engine exhausts, evaporation and rubbish burning.

Dr. F. W. Went, professor of plant physiology, California Institute of Technology, Los Angeles, discussed the effect of smog on plant life, and he pointed out that the best solution to the problem was to prevent the formation of substances which in combination produce the irritants. Tests conducted at the Earhart Laboratory had shown that the smog was generally molecular, and carbon filters were the only effective filtering agent. His photographs and observations indicate that irritating smog was present in most industrial areas throughout the Western Hemisphere and probably throughout the world.

The effectiveness of activated carbon as an adsorber was brought out by John Mueller, of the Day and Night Manufacturing Co. In his talk he emphasized the importance of indoor climate control and the reduction of irritating smog.

During the business meeting the following were elected to serve as officers for the 1954-55 season: *President*—C. D. Walz; *Vice President*—J. L. McCullough; *Secretary*—H. F. Ulovec; *Treasurer*—W. J. Biggar; *Board of Governors*—K. A. Bowman, Robson English, A. Z. Levine, and J. R. Hall. Attendance 85.

• *ARIZONA*: Pres. L. N. Hunter, Johnstown, Pa., was the guest speaker at the Chapter's April meeting. President Hunter presented his talk on *Rating of Heating Boilers*.

Following dinner, Pres. V. J. Carns called the meeting to order and the minutes of the preceding meeting were read and approved. Reports were also presented by the program and publicity committees. Attendance 36. Attendance ratio 0.48.

• *ARKANSAS*: The April meeting was presided over by Pres. R. E. Blaylock, and the 18 guests present were introduced, of whom a number were prospective Chapter members. President Blaylock announced that the Chapter had been invited to inspect the new steam generating plant of the Arkansas Power & Light Co. in North Little Rock.

T. A. Welch, branch manager of Carrier Corp., Memphis, spoke on *The 24-Hour Load Calculation Method*. Mr. Welch pointed out the importance of correct selection of equipment, stressing that over-sizing can be uneconomical and inefficient. The question and answer period which followed indicated the interest in residential air conditioning. Attendance 40. Attendance ratio 0.37.

• *BRITISH COLUMBIA*: Balloting resulted in the following slate installed by M. E. Minaker for the coming year: *President*—S. C. Gale; *Vice President*—C. Van Boeyen; *Treasurer*—R. D. Hale; *Secretary*—D. A. English; *Board of Governors*—D. W. Thomson and J. M. Bird.

R. D. Hale presented an in absentia report at the May meeting for Treasurer C. Van Boeyen.

After a few words of thanks, Pres. C. W. Leek turned the chair over to Mr. Gale.

An Industrial Scale Heating System Using Waste Heat from an Atomic Reactor was the subject of the guest speaker, R. T. Jaske, Hanford Atomic Plant, General Electric Co. Attendance 29. Attendance ratio 0.46.

• *CENTRAL OHIO*: An interesting panel discussion of the future of air conditioning was carried on at the May meeting by R. H. Harman, *From the Architect's Viewpoint;* J. W. Ford, *From the Consulting Engineer's Viewpoint;* and F. A. Shuler, *From the Distributor's Viewpoint*.

R. S. Curl, chairman of the civic betterment committee, reported on the relaxation of permit requirements in city codes.

Unanimously elected officers were: *President*—J. A. Guy; *Vice President*—R. A. Wilson; *Secretary*—W. A. Schoonover; *Treasurer*—T. R. Walker; *Board of Governors*—J. W. Ford and E. T. Stluka. Attendance 54. Attendance ratio 0.41.

• *DELTA*: A. J. Hess, *ASRE* President and ASHVE Council member addressed the joint *ASRE*-ASHVE

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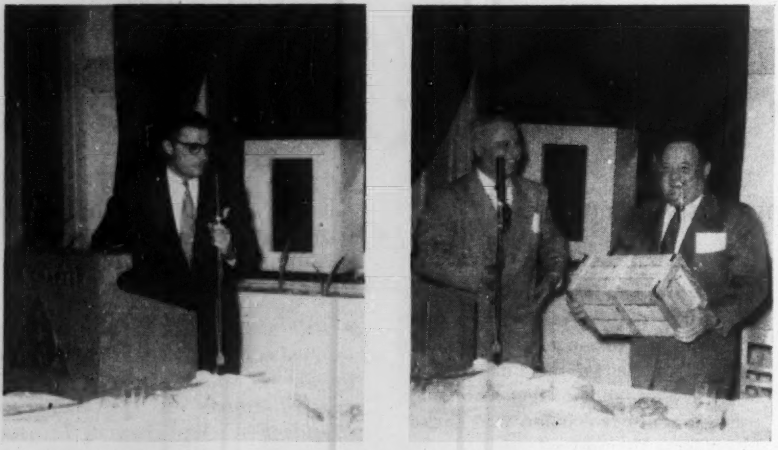
*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

JOURNAL SECTION



Joint *ASRE*-ASHVE Meeting in New Orleans. *(Left)* ASHVE Pres. H. L. Salaun calling the meeting to order. *(Right)* Walter Cooke presents A. J. Hess with a crate of choice strawberries

March supper meeting. Mr. Hess spoke to the members of the two societies on *Panel Cooling*, discussing the possible reduction in building space cost. A vote of thanks was given for his excellent talk, and he was presented with a crate of choice strawberries.

Pres. H. L. Salaun dispensed with any Delta Chapter business, except a report by O. F. Schully, membership chairman, and turned the meeting over to John Marton, *ASRE* chairman. Attendance 82. Attendance ratio 0.40.

• *EMPIRE STATE CAPITAL*: The April meeting was the Chapter's Annual Ladies Night. A very enjoyable social hour, followed by an excellent dinner with all the trimmings, was the highlight of the evening. The ladies were presented with cigarette boxes as souvenirs.

During the evening Pres. N. W. Burrill was presented with a past president's pin, and Life Membership in the Chapter was presented to R. B. Taylor, first president of the Chapter. Attendance 209.

• *EMPIRE STATE CAPITAL*: The committee for the Annual Ladies Night held on April 30 received general acclaim at the May meeting for an outstanding job.

Secy. L. V. Appleby was ordered to cast one ballot for the slate of officers: *President*—E. C. Doyle; 1st *Vice President*—G. G. Davis; 2nd *Vice President*—L. V. Appleby; *Secretary-Treasurer*—H. F. Kruger; *Board of Governors*—R. F. Peck, F. W. Sheldon and E. J. Mahoney.

Retiring Pres. N. W. Burrill thanked the officers and members for their cooperation, and turned the meeting over to Mr. Doyle, who remarked on the need for careful selection of the various committees, and for emphasis on quality rather than quantity in the choice of new members. Attendance 17.

• *GOLDEN GATE*: Speaker of the evening was D. D. Wile, chief engineer of Refrigeration Engineering, Inc., Los Angeles, who spoke on *Designing Air Conditioning Systems*, particularly with respect to avoiding clamminess on muggy days.

Pres. J. E. Murray called the meeting to order and minutes of the April meeting were read and approved. D. E. McLeod, secretary, read the report of the nominating committee, and he was instructed to prepare ballots for election of officers at the June meeting. President Murray reported on arrangements in progress for the 1955 Semi-Annual Meeting to be held in San Francisco. Attendance 57.

• *ILLINOIS*: M. L. Hoglund, manager of the Refrigeration Department of Trane Co., LaCrosse, Wis., was introduced by J. H. Stiggleman. Mr. Hoglund, speaker for the April meeting, chose as his topic, *Proper Application and Balancing of a Compressor and Evaporator in an Air Conditioning System.* In developing his talk he broke down an air conditioning system into its component parts of the direct expansion coil or evaporator, condenser and compressor, confining his discussion of compressors to the reciprocating type. With the use of slides and charts he proceeded to demonstrate the need for proper balance between all the component parts.

Pres. H. G. Chapin presided over the meeting, and a report was given by the membership committee. Attendance 117.

• *INLAND EMPIRE*: Dean James McGivern of Gonzaga University spoke on *Natural Gas* at the May meeting. Since gas will soon be piped to the Spokane area, the topic was very timely.

Reports were made by Vice Pres. H. A. Bickel, Secy. F. W. Jenkinson, Treas. Max Tonn, Attendance Chairman R. B. Campbell and Membership Chairman L. E. Marque.

President Bickel presented a set of inscribed cast bronze bookends to retiring Pres. G. M. Dieter as a token of appreciation from the membership. President Dieter thanked the officers and membership for their cooperation, and Mr. Marque conducted the new officers' installation ceremonies. Attendance 20.

• *IOWA*: Election of officers for 1954-55 took place at the May meeting with the following results: *President*—W. E. Nanes; *Vice President*—G. J. Kraai; and *Secretary-Treasurer*—D. E. Schroeder.

D. E. Wells presented an interesting and informative movie, entitled *Design and Application of Exhaust Hoods*, through the courtesy of the American Air Filter Co.

Pres. J. F. Sandfort, who presided at the meeting, turned the gavel over to incoming President Nanes. In return Mr. Sandfort was presented with a past president's pin by R. H. Schnell. Attendance 33. Attendance ratio 0.34.

• *KANSAS*: Program Chairman Charles Yoe introduced the speaker of the evening, H. W. Alyea, chief field engineer, Johnson Service Co., Milwaukee. Mr. Alyea, in speaking on his subject, *New Trends in Automatic Controls*, presented recent developments in control equipment along with new and useful methods of application. Shortcomings of some of the existing practices in the use of automatic controls were pointed out, and improved methods were suggested.

The following officers were elected at the April meeting for the 1954-55 season: *President*—Charles Yoe; *Vice President*—A. B. Newton; *Secretary*—T. L. Roberts; and *Treasurer*—H. M. Skalla. Pres. R. L. Pennington presided over the meeting. Attendance 33. Attendance ratio 0.31.

• *KANSAS CITY*: Perfect attendance records for the year were announced for 16 members at the May meeting.

New officers elected for 1954-55 were: *President*—F. K. Ladewig; *Vice President*—A. S. Hurt, Jr.; *Secretary*—R. M. Spencer; *Treasurer*—S. C. McCann; *Board of Governors*—G. H. Stoffer, Henry Nottberg, Jr. and C. S. Graves. Pres. G. H. Stoffer received the past president's pin and congratulations from incoming President Ladewig.

W. E. Gleeson, sales promotion manager, McDonnell & Miller Inc., Chicago, spoke on *Safety Controls on Steam and Hot Water Boilers*. Attendance 98. Attendance ratio 0.36.

• *MANITOBA*: The feature of the April meeting was the showing of two very interesting films, entitled *Dust Control* and *Design for Learning*, shown through the cooperation of Darling Brothers, Ltd.

Following the opening of the business meeting, the minutes of the previous meeting were read and approved. It was announced that the May meeting would be the final meeting of the season and that election of officers for 1954-55 would be held at this meeting. Attendance 16.

• *MASSACHUSETTS*: The Faculty Club of the Massachusetts Institute of Technology was the scene of the May meeting.

A. V. Hutchinson, ASHVE executive secretary, and R. T. Kern, general chairman of the Committee on Arrangements for the Semi-Annual Meeting, urged support for the meeting at Swampscott, Mass., June 28-30.

New officers installed were: *President*—G. W. Sprague; *Vice President*—G. D. Fife; *Treasurer*—W. G. Martin, Jr.; *Secretary*—W. G. Burbo; *Board of Governors*—R. G. Vanderweil, E. M. Tracey and J. A. Ivester.

Past Pres. G. B. Torrens presented a past president's pin to A. L. Hare. Attendance 49.

• *MINNESOTA*: A Minnesota Chapter member was the speaker at the May meeting. William Sturm, chief mechanical engineer, Ellerbe & Co., Minneapolis, spoke on *Hospital Air Conditioning*.

Pres. V. E. Pearson, in retiring, paid tribute to the cooperation he received from the officers and committee chairmen. He turned the gavel over to the incoming president, J. A. Craig, who presented Mr. Pearson with an engraved pen set from the Chapter as a token of appreciation. President Craig announced the results of the election of officers as follows: *Vice President* — J. S. Locke; *Secretary* — E. T. Erickson; *Treasurer* — F. G. Vogt; *Board of Governors* — William Sturm and G. M. Kendrick. Attendance 145.

• *MISSISSIPPI*: Following the opening of the April meeting the financial report was given by T. E. Stepan, treasurer. A motion was made and passed that the Chapter continue holding meetings right through the summer.

G. E. Kane of A. M. Byers Wrought Iron Co. was introduced by J. W. Taylor. Mr. Kane showed a film entitled *Eternally Yours*, which traced the development of the wrought iron industry through the ages up to the present time. Attendance 21.

• *NEBRASKA*: The April meeting was presided over by Pres. O. J. Smith. The following were appointed to serve as a nominating committee to select candidates for 1954-55: K. E. Martin, K. R. Magarrell, G. W. Colburn, C. A. Carter and Verne Simmonds.

The program for the evening consisted of a talk by H. W. Alyea, chief field engineer, Johnson Service Co., Milwaukee, on *New Trends in Automatic Controls*. Mr. Alyea discussed application of zone control for both heating and summer cooling installations. Attendance 49.

• *NEW YORK*: *Humidity Control Systems for Comfort and Processing* was the topic at the May meeting of guest speaker F. M. Johnson, sales manager, air conditioning, Surface Combustion Corp., Toledo.

Retiring Pres. J. E. Schechter spoke of his great pleasure in having served the Chapter on the Board of Governors and as president. Past Pres. J. S. Johnson presented a plaque to Mr. Schechter in recognition of his service this past year. Mr. Schechter presented the incoming officers and turned over the gavel to Pres. R. L. Stinard. Attendance 100. Attendance ratio 0.15.

• *NORTHEASTERN OKLAHOMA*: Pres. R. W. Winget called the regular monthly meeting to order, and the minutes of the March meeting were read and approved.

F. J. Nunlist, Jr., vice president, Mueller Climatrol, Milwaukee, was speaker for the April meeting. Mr. Nunlist discussed the results of the test work on perimeter cooling being done by the University of Illinois in cooperation with the

National Warm Air Heating and Air Conditioning Association. A question and answer period followed the talk. Attendance 26. Attendance ratio 0.38.

• *NORTHERN OHIO*: Richard Hayman of the W. H. & L. D. Betz Co., with the aid of slides, discussed in detail the three main causes of interior pipe corrosion and methods to control it.

Pres. J. M. Black called the April meeting to order, and the minutes of the March meeting were approved as read. W. F. D. Neiheiser, treasurer, presented the financial report, and R. L. Byers presented the nominating committee's candidates for officers for 1954-55. Attendance 54.

• *NORTHERN PIEDMONT*: At the April meeting permission was granted to Secy. W. H. Cooper to do minor editing of the Chapter By-Laws.

G. H. Ficken, program chairman, introduced the speaker, J. D. Loveley, chief engineer of the Airtemp Division, Chrysler Corporation. Mr. Loveley spoke on the *Merits and Applications of Air Cooled Packaged Refrigeration Units as Compared with Water Cooled Units.* Attendance 58. Attendance ratio 0.63.

• *OREGON*: Sixty-five members and guests attended the first meeting of the sixteenth year of the Oregon Chapter, held May 6 at the Columbia Athletic Club, and called to order by Pres. E. E. Kelly.

T. H. McClung introduced speakers Don Johnson and Myron Knudsen of the Chas. Klaus Co., Allen-Bradley representatives, who made interesting presentations on *Electric Motor Controls.* Each of the speakers presented a part of the talk and jointly conducted an active discussion period.

O. T. Jacobson, chairman, attendance committee, announced plans for making awards to members having outstanding attendance records. A. P. Crombie reported that members had donated 24 copies of THE GUIDE 1953 for the student branch at Oregon State College.

Chapter sponsorship of the Ninth Oregon State Air Conditioning Conference was deferred at least until 1956. The meeting was adjourned at 10:15 p.m.

• *OTTAWA VALLEY*: Candidates for officers for 1954-55 were presented by the nominating committee, and D. F. MacDonald, G. B. Place and A. G. Orr were appointed tellers of election for the May meeting. Pres. G. L. Ostiguy also appointed an auditing committee consisting of: E. H. J. Barber, J. W. Green and G. A. Gray. Bernard Stotesbury presented President Ostiguy with a past president's pin for 1952-53.

Irving Goodman introduced B. E. Judges of Toronto, who spoke on refrigeration at the April meeting. Mr. Judges explained, with the use of slides, the basic refrigeration cycle and went into detail on the uses of the various types of equipment together with the importance of proper selection of equipment. He also compared different types of equipment, and touched on the various methods of capacity control of compressors and the various refrigerants used today. Attendance 40. Attendance ratio 0.83.

• *PACIFIC NORTHWEST*: Prof. E. O. Eastwood, past president and Life Member of the Society, introduced the guest of honor at the April meeting, Society Pres. L. N. Hunter, Johnstown, Pa. Mr. Hunter spoke on *The Rating of Heating Boilers* and supplemented his talk with slides. Prior to his talk, Mr. Hunter gave an interesting discussion on current Society activities.

Pres. H. T. Orebaugh called the meeting to order, and announced that election of officers would take place at the May meeting. Attendance 54. Attendance ratio 0.39.

• *PITTSBURGH*: Announcement was made at the May meeting of the big *ASRE*-ASHVE golf meet on June 8.

A single ballot was cast for the following officers: *President* — E. C. Hach; *Vice President* — C. L. Benn; *Treasurer* — G. W. Cost; *Secretary* — E. H. Riesmeyer, Jr.; *Board of Governors* — C. H. Schneider, A. W. Marshall and John Allison.

Retiring Pres. C. H. Schneider thanked the committee members for their help, and accepted a past president's pin from the new president. Attendance 52.

• *ST. LOUIS*: The election of officers for the St. Louis Chapter made front-page news in the *St. Louis Daily Record.* Those elected by the membership and presented by past presidents at the May meeting were as follows: *President* — G. H. Bemarkt; *Vice President* — E. T. Clucas; *Secretary* — W. P. Norris; *Treasurer* — F. E. Ince; *Board of Governors* — G. B. Pattiz and C. K. Meyers.

Pres. H. C. Sharp outlined the achievements of the past year, and was presented with a past president's pin by J. H. Carter.

The guest speaker of the meeting was R. N. Lane, University of Texas, who spoke on acoustical techniques. Attendance 49.

• *SHREVEPORT*: Pres. M. A. Hudson presided over the meeting, and H. E. Scott, membership committee chairman, presented the committee's report. President Hudson announced the appointment of the following nominating committee: W. E. FitzGerald, chairman, S. W. Beaty, R. M. Hood, A. H. Otto and W. S. Evans. The auditing committee was also appointed, consisting of: A. L. Jones, Jr., chairman, L. E. Kneipp and D. L. Lottinger.

The speaker at the April meeting was W. J. J. Walker of Carrier Corporation, who spoke on *Design Problems and Characteristics of High Velocity Air Distribution Systems.* Attendance 39. Attendance ratio 0.82.

• *SOUTH TEXAS*: Highlight of the April meeting was a talk by W.

E. Lind of the A.R.A. Manufacturing Co. of Fort Worth, who spoke on *Automobile Air Conditioning.* Mr. Lind outlined the development of automobile air conditioning from 1949 to the present time. He pointed out that while it used to take about a week to install an air conditioning system in a car, now it can be accomplished in slightly over four hours. Mr. Lind stated that future development might involve aluminum one-cylinder compressors with operating speeds of from 7000 to 8000 rpm.

Pres. E. G. Floeter, Jr. called the meeting to order, and F. M. Neil, secretary, read the minutes of the March meeting, which were approved with a slight correction. The treasurer, J. C. Lewis, presented a financial report, and B. P. Fisher presented the nominating committee's report. Attendance 61. Attendance ratio 0.29.

• *SOUTHERN CALIFORNIA*: Members were treated to an excellent resume on the subject of *Rating of Heating Boilers,* presented by Pres. L. N. Hunter, Johnstown, Pa., at the April meeting. Mr. Hunter described some of the reasons for inconsistencies of manufacturers in rating boilers. The codes for standardization of ratings have improved design because they provide a sound basis for estimating performance. He explained the meaning of various nomenclature used in codes and the differences and limitations of the various codes.

Pres. L. B. Davenport called the meeting to order, and J. S. Earhart presented the report of the nominating committee. Attendance 78.

• *SOUTHERN PIEDMONT*: Creed Gilley, industrial manager of the Charlotte Chamber of Commerce, was speaker at the April meeting. Speaking on *The Economic Growth and Industrial Potentialities of Charlotte,* Mr. Gilley revealed some interesting facts about Charlotte and its position in the commercial and industrial Southeast.

Following the opening of the business meeting, the minutes for the March meeting were approved with a slight correction, and C. M. Setzer, Jr., treasurer, presented a report. Attendance 24.

• *WASHINGTON, D. C.*: A dinner dance took the place of the regular May meeting. Proceedings began with a very enjoyable social hour, followed by a delicious filet mignon dinner.

Retiring Pres. J. G. Muirheid was presented with a past president's pin, and he introduced incoming Pres. G. C. F. Asker. President Asker spoke briefly on plans for the coming year, stressing in particular the plans to increase Chapter membership.

This was followed by dancing till midnight to Gordon Marshall's orchestra. Attendance 94.

• *WEST TEXAS*: The feature of the meeting was the presentation of a color movie, entitled *Geni of the Flame,* by William McCaroll, representative of the Pioneer Natural Gas Co.

Pres. L. C. McKay called the meeting to order, and the March minutes were read and approved. A discussion ensued regarding future meetings, and it was voted to hold the regular June meeting in Midland and to dispense with the July and August meetings, holding in their place a single outdoor social gathering. Attendance 25.

• *WESTERN MICHIGAN*: G. V. Parmelee, ASHVE Research Laboratory, Cleveland, gave an excellent talk at the April meeting on the influence of solar radiation on heating and cooling, and methods of controlling this influence. D. W. Locklin introduced the speaker.

Duly elected officers were as follows: *President*—F. W. Brundage; *Vice President*—S. M. Paganelli; *Secretary*—F. L. Murray; *Treasurer*—N. A. Buckley; *Board of Governors*—J. T. Anderson, F. K. Platt and W. W. Edwards.

Pres. J. T. Anderson asked the auditing committee to prepare a report for the next meeting. Attendance 84. Attendance ratio 0.28.

• *WISCONSIN*: *New Concepts in Compressor Design* was the subject of a well-received talk by W. G. Wassmandorf of the Trane Co. at the April meeting. By means of slides he explained the theory of evaporative cooling and refrigeration. The important design factors in a compressor are efficiency, compactness, reliability and serviceability. Mr. Wassmandorf explained some of the improvements in compressor construction, *e.g.,* the use of aluminum piston rods and pistons and direct connected motors. In his opinion serviceability is most important in compressor design for the convenience of the user and repairman.

Pres. N. W. Hill called the meeting to order, after which the minutes of the previous meeting were approved as read. Reports were made by the treasurer, the membership and code committees. Attendance 68. Attendance ratio 0.22.

STUDENT BRANCHES

• *PURDUE UNIVERSITY*: The May meeting was held at the residence of F. B. Morse, faculty adviser.

Officers elected for the coming school year were: *President*—E. B. Katz; and *Secretary*—R. A. Chambers.

It was announced that eight members will graduate with BSME degrees this term. Attendance 18. Attendance ratio 0.83.

• *PURDUE UNIVERSITY*: The Student Branch's meeting was held in conjunction with the April meeting of the Indiana Chapter of ASHVE. Highlight of the evening was the address on *High Pressure Distribution Systems with Double Ducts,* given by R. D. Tutt, chief engineer, Tuttle & Bailey, New Britain, Conn. In addition Mr. Tutt demonstrated the system.

JOURNAL SECTION

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 93 applications for membership, including 4 reinstatements and 3 students; in addition 5 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by July 30, 1954, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

Arizona

BOMAR, E. B., Owner, E. B. Bomar Co., Phoenix. REFERENCES: E. P. Boothroyd, M. M. Lowry, J. P. Sorenson, W. L. Whitaker.

†HARTLINE, W. R., Sr. Mech. Engr., Headman, Ferguson and Carollo, Phoenix. REFERENCES: A. C. Baechlin, Jr., V. J. Carns, F. W. Gabbard, W. A. Kopp.

Arkansas

ANDERSON, B. R., Archt., Bruce R. Anderson, Little Rock. REFERENCES: A. T. Bevil, R. E. Blaylock, J. H. Carnahan, E. N. Pettit.

California

LUNDY, D. R., Mech. Engr., The Austin Co., Oakland. REFERENCES: D. P. Holmes, F. W. Maynard*, M. P. Superak*, G. J. Yamas.

TAYLOR, F. H., Mech. Engr., U. S. Army Corps of Engineers, Sacramento. REFERENCES: Carl Jack*, W. L. Lander, E. C. McKinsey, R. J. Sykes*.

Colorado

DIMERCURIO, CYRIL, Sales Engr., J. N. Doyle Co., Denver. REFERENCES: N. H. Brickham, J. J. Johnson, H. W. Marshall, J. F. Mohan.

Florida

LYNCH, W. J., Chief Engr., J. H. Cobb, Inc., Sarasota. REFERENCES: R. J. Clark, G. C. Hall, G. P. Patterson, B. A. Thomas.

Georgia

JONES, T. M., JR., Engr., John L. Underwood Co., Inc., Atlanta. REFERENCES: J. J. Crowley, F. H. Nelson, J. L. Underwood, M. W. Wise.

Illinois

RICH, S. H., Export Mgr., McDonnell & Miller Inc., Chicago. REFERENCES: F. A. Hamlet, E. N. McDonnell, E. W. Rietz, N. W. Swanson.

Indiana

△JAQUES, E. W., Htg. Engr., A. Hattersley & Sons, Fort Wayne. REFERENCES: F. H. Coe, Jr., E. H. Hattersley, C. H. Penningroth, J. D. Pressler.

WEBER, R. H., Sales Mgr., Consolidated Industries, Inc., Indianapolis. REFERENCES: R. C. Blackman, S. E. Fenstermaker, D. C. Fulk, A. C. Pfau.

Iowa

JAMESON, R. E., Sales Engr., The Trane Co., Des Moines. REFERENCES: J. R. Bain, W. G. Barnard, T. R. Johnson, M. R. Paulsen.

Louisiana

△CASTIGLIONE, C. B., Dist. Mgr., Marshall, Neil & Pauley, Inc., New Orleans. REFERENCES: Ralph Elizardi, J. F. Marshall, F. M. Neil, R. R. Tucker*.

FRIED, D. B., JR., Owner, D. B. Fried, Jr., Mfrs. Agent, New Orleans. REFERENCES: R. K. Goode, G. A. Hero, Jr., E. H. Sanford, T. A. Stokes.

JOHNSON, R. L., JR., Mfrs. Repr., Shreveport. REFERENCES: John Dart, Jr., W. H. Dudley, Jr., L. E. Kneipp, D. L. Lottinger.

SKINNER, C. B., JR., Mech. Engr., W. H. Grant, Jr., New Orleans. REFERENCES: W. H. Grant, Jr., W. B. Martin, Jr., E. H. Sanford, T. A. Stokes.

Maryland

THOMAS, W. G., Mgr., Roche & Hull, Inc., Baltimore. REFERENCES: George Gist, Bruce Kane, R. R. Poole, G. J. Roche.

Massachusetts

MATHER, C. T., Htg. Engr., Fall River Steam & Gas Pipe Co. Corp., Fall River. REFERENCES: Frank Gall, J. A. Ivester, J. K. MacLean, A. L. Nelson.

Michigan

†KOLASA, M. J., Sales Engr., Westinghouse Electric Corp., Sturtevant Div., Detroit. REFERENCES: Donald Begg, J. N. Livermore, Robert Mercer, D. F. Robertson.

KUTHE, C. H., Tech. Sales Mgr., Wolverine Tube Div., Calumet & Hecla Inc., Detroit. REFERENCES: L. L. Arbuckle, B. H. Bigham, W. D. Dixon*, R. C. Zawacki*.

POTTER, W. C., Appl. Engr., Mechanical Heat & Cold, Inc., Highland Park. REFERENCES: J. S. Blossom, P. S. Hosman, T. H. Mabley, J. E. Wilson.

△TUFFORD, N. E., Mech. Engr., Michigan State College, E. Lansing. REFERENCES: A. A. Aiken, J. R. Anderson, J. M. Campbell*, C. H. Pesterfield.

Minnesota

ABE, W. T., Mech. Engr., Nielsen & Bruch, Cons. Engrs., Minneapolis. REFERENCES: W. C. Bruch*, B. D. Freedland, L. C. Gross, B. J. Mulcahy.

LINFOOT, C. L., Mgr., Htg. Dept., C. L. Linfoot Co., East Grand Forks. REFERENCES: J. W. McNamara, William McNamara, H. L. Patry, G. W. Robbins.

TURNER, HARLEY, Repr., William Brothers Boiler & Manufacturing Co., Minneapolis. REFERENCES: H. D. Barr, A. H. Kimball, K. W. Miller, R. W. Otto.

New Mexico

△BRIDGERS, F. H., Partner, Bridgers and Paxton, Cons. Engrs., Albuquerque. REFERENCES: J. M. Huff, C. L. Leopold, H. F. Munn, Y. S. Touloukian.

DAVIS, C. G., Engr., Technical Service Co., Albuquerque. REFERENCES: M. F. Fifield*, W. L. Jones, H. F. Munn, J. H. Van Alsburg.

DOREMIRE, L. A., Vtg. Design Engr., Los Alamos Field Office, University of California, Los Alamos. REFERENCES: J. B. Graham, J. K. James, H. F. Munn, R. C. Neal.

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WILLIAM W. BRADFIELD
Grand Rapids, Mich.

The Society has been informed of the death of one of its Life Members, William W. Bradfield. Mr. Bradfield died on May 4 in Kalamazoo, Mich., at the age of 80.

Mr. Bradfield was born in Niagara Falls, Ont., on December 17, 1873. He attended Union High School and received the degree of B.S. in electrical engineering upon graduation from Purdue University.

In 1900 he started as chief mechanical and electrical engineer for a Cincinnati firm, and opened his own business in Grand Rapids, Mich., in 1903. Responsible for the construction of numerous grade schools, high schools, and state departments of health, Mr. Bradfield gained a national reputation. He was a member of the *Grand Rapids Engineering Society*, as well as a past president of the Western Michigan Chapter, ASHVE. He had joined the Society in 1926, and became a Life Member in 1943.

After his retirement in 1950, Mr. Bradfield and his wife toured the United States in a house trailer, finally settling in Fort Lauderdale, Fla. The Officers and Council of the Society extend their sincere sympathy to his wife, Goldia, and his sons, Gordon and William W., Jr., who joined his father in ASHVE membership.

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ASHVE Committee on Safety Regulations for Heating, Ventilating and Air Conditioning Systems: G. P. Nachman, Chairman; F. H. Buzzard, H. W. McKenzie, B. F. McLouth, C. H. Randolph.

Joint Committee for Revision of Code of Minimum Requirements for Comfort Air Conditioning: W. L. Fleisher, Chairman; (ASHVE) O. W. Armspach, A. C. Buensod, C. C. Cheyney; (ASME) C. F. Kayan; (ASRE) F. H. Faust, C. F. Holske, J. A. Schurman; (ARI) M. M. Lawler, R. A. Gonzalez; Alternate: J. R. Schreiner; (U.S. Public Health Service) W. C. Cooper, M.D.; At Large: M. K. Fahnestock, P. J. Marschall, G. E. May, A. B. Newton; (Medical Profession) R. W. Keeton, M.D., W. J. McConnell, M.D.

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*Member of Committee on Research.

ASHVE — OFFICERS OF CHAPTERS AND BRANCHES

(56 Chapters; 1 Special Branch; 8 Student Branches)

Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

- **ARIZONA:** 1953. Hdqrs., Phoenix, Ariz. PRESIDENT, V. J. Carns, 3602 No. 15th Dr. SECRETARY, A. J. Nelesen, Jr., 6744 No. 14th Pl.
- **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, Third Tuesday. PRESIDENT, R. E. Blaylock, 509 E. Markham St. SECRETARY, J. L. Brown, 212 Terminal Warehouse Bldg.
- **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, Second Monday. PRESIDENT, J. M. Lazenby, 8 11th St., N.E. SECRETARY, F. W. Bull, 1205 Spring St., N. W.
- **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, Third Wednesday. PRESIDENT, E. H. Taze, 33 E. 21st St. (18). SECRETARY, R. F. Weisman, 4650 Reisterstown Rd., (15).
- **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. Meets, Second Wednesday. PRESIDENT, S. C. Gale, 1628 W. 4th Ave. SECRETARY, D. A. English, 1606 W. 1st Ave. (9).
- **CENTRAL NEW YORK:** 1944. Hdqrs., Syracuse, N. Y. Meets, Fourth Wednesday. PRESIDENT, F. D. Putnam, 115 Pulsifer Dr., Auburn. SECRETARY, Merle Weninger, 113 Eloise Ter.
- **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, Third Monday. PRESIDENT J. A. Guy, 478 W. Fifth Ave. (1). SECRETARY, W. A. Schoonover, 2901 N. High St. (2).
- **CINCINNATI:** 1932. Hdqrs., Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT F. W. Wilson, 222-24 E. 14th St. SECRETARY, R. G. Anderson, 1758 Elmore St. (23).
- **CONNECTICUT:** 1940. Hdqrs., New Haven, Conn. Meets, Third Thursday. PRESIDENT, C. L. L'Hommedieu, 76 Blatchley Ave. SECRETARY, Walter Heywood, 14 Hartt Lane, Newington.
- **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, Third Tuesday. PRESIDENT, C. V. Bankston, 2927 Jackson Ave. (25). SECRETARY, W. B. Martin, Jr., 2014 Rendon St. (15).
- **EMPIRE STATE CAPITAL:** 1951. Hdqrs., Albany, N. Y. Meets, Second Wednesday. PRESIDENT, E. C. Doyle, 315 Washington Ave. SECRETARY, H. F. Kruger, 501 Seventh Ave., Troy.
- **GOLDEN GATE:** 1937. Hdqrs., San Francisco, Calif. Meets, First Thursday. PRESIDENT, Eric Roberts, 417 Market St. SECRETARY, F. K. Crouch, 906 Cerrito St., Albany (6).
- **ILLINOIS:** 1906. Hdqrs., Chicago, Ill. Meets, Second Monday. PRESIDENT, George V. Zintel, 840 N. Michigan Ave. (11). SECRETARY, H. G. Gragg, 228 N. LaSalle St. (1).
- **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, Fourth Tuesday. PRESIDENT, P. O. Patterson, 2701 Roosevelt Ave. SECRETARY, A. O. Roche, Jr., 3950 Broadway (5).
- **INLAND EMPIRE:** 1950. Hdqrs., Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, H. A. Bickel, E. 7 Riverside Ave. SECRETARY, Max Tonn, S. 4021 Latawah St.
- **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, W. E. Nanes, 220 Davidson Bldg. SECRETARY, D. E. Schroeder, 2717 Cambridge.
- **KANSAS:** 1951. Hdqrs., Wichita, Kan. Meets, Tuesday after First Monday. PRESIDENT, Charles Yoe, P.O. Box 2239. SECRETARY, T. L. Roberts, 2008 S. Parkwood Lane.
- **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, First Monday. PRESIDENT, F. K. Ladewig, 3527 Broadway (11). SECRETARY, R. M. Spencer, 1510 Main St.
- **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, Fourth Thursday. PRESIDENT, D. B. Brace, 1550 Dublin Ave. SECRETARY, G. T. Christie, Midland & Notre Dame.
- **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, Third Tuesday. PRESIDENT, G. W. Sprague, 16 Curtis St., Marblehead. SECRETARY, W. G. Burbo, 137 Newbury St. (16).
- **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, Third Monday. PRESIDENT, A. W. Shelby, 972 Union Ave. SECRETARY, A. T. Bevil, 1638 Union Ave. (4).
- **MIAMI VALLEY:** 1950. Hdqrs., Dayton Ohio. Meets, First Wednesday. PRESIDENT John Schweiger, 593 Acorn Drive, (9). SECRETARY, D. E. Tullis, 743 Kiser St. (4).
- **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, E. F. Glanz, 1761 W. Forest Ave. (8). SECRETARY, J. H. Spitzley, 1200 Fort St., W. (26).
- **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, First Monday. PRESIDENT, J. A. Craig, 814 South Ninth St. (4). SECRETARY, E. T. Erickson, 500 Baker Arcade (2).
- **MISSISSIPPI:** 1953. Hdqrs., Jackson, Miss. PRESIDENT, I. E. Rowe, 120 Georgia St. SECRETARY, M. E. Price, 205 Arbor Hill Dr.
- **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, D. L. Lindsay, 4350 Sherbrooke St. (6). SECRETARY, S. R. Plamondon, 2267 Melrose Ave. (14).
- **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, Second Tuesday. PRESIDENT, C. A. Goth, 3115 N. 49th Ave. SECRETARY, L. J. Paulsen, 1901 S. 39th St.
- **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, Third Monday. PRESIDENT, R. L. Stinard, 51 E. 42nd St. (17). SECRETARY, Carl H. Flink, 62 Worth St. (13).
- **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, Second Tuesday. PRESIDENT, H. M. Patrick, 20 Olcott Ave., Bernardsville. SECRETARY, W. C. Kruse, Jr., 40 E. Park St. (2).
- **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, Third Monday. PRESIDENT, M. W. Brown, 1213 Texas Bank Bldg. SECRETARY, H. G. Gregerson, 2921 Fairmount.
- **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, Second Tuesday. PRESIDENT, R. W. Winget, 2428 E. 11th St., Box 100. SECRETARY, J. T. McKinney, 1341 So. Boston.
- **NORTHERN OHIO:** 1916. Hdqrs. Cleveland, Ohio. Meets, Second Monday. PRESIDENT, J. M. Black, 1296 Gordon Rd., Lyndhurst. SECRETARY, Sherwood Nassau, 6014 Euclid Ave.
- **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N.C. Meets, Second or Third Friday. PRESIDENT, R. B. Crosland, Jr., 1001 S. Marshall St., Winston-Salem. SECRETARY, W. H. Cooper, 1001 S. Marshall St., Winston-Salem.
- **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, G. E. Ervin, 2800 N. Oklahoma St. (5). SECRETARY, F. R. Denham, 320 Oklahoma Natural Bldg.
- **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Metts, First Monday. PRESIDENT, M. C. Bailey, 1139 Bay St. SECRETARY, H. R. Roth, 57 Bloor St., W.
- **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, E. E. Kelly, 4504 S.W. Corbett Ave. (1). SECRETARY, K. N. Flocke, 3027 N.E. 31st Ave. (12).
- **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. Meets, Third Tuesday. PRESIDENT, W. J. Robinson, 1174 Wellington St. SECRETARY, N. J. Howes, Box 264 R.R. 1.
- **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, Second Tuesday. PRESIDENT, T. C. Caskey, 11642—26th Ave., So. (88). SECRETARY, E. W. Triol, 407 Medical Arts Bldg.
- **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, L. M. Church, 12 So. 12th St. (7). SECRETARY, C. J. Forve, Parkwood Manor, Apt. B-202, State Rd. & Penarth Ave., Upper Darby.
- **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, E. C. Hach, 221 Broadmoor Ave. (34). SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St. (22).
- **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, First Wednesday. PRESIDENT, H. L. Wray, 1101 Geneva St., Aurora. SECRETARY, J. F. Cipra, Jr., 2676 S. Madison St.
- **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. Meets, First Wednesday. PRESIDENT, E. C. McKinsey, 4220 Annette (21). SECRETARY, R. A. Sarro, 5412 Argo Way.
- **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, G. H. Bemarkt, St. Clair Dr., R.R. 1, Caseyville. SECRETARY, W. P. Norris, 1118 Fullerton Bldg.
- **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, Third Thursday. President, J. S. Malahy, Jr., 1839 Line Ave. SECRETARY, H. E. Scott, 2502 Woodford St.
- **SOUTH CAROLINA:** 1954. Hdqrs., Columbia, S. C. PRESIDENT, R. F. Donovan, P.O. Box 5204. SECRETARY, J. E. McMurray, 1639 Blanding St.
- **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, Third Friday. PRESIDENT, E. G. Floeter, Jr., P.O. Box 1657 (1). SECRETARY, F. M. Neil, 3513 W. Dallas Ave. (19).
- **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, C. D. Walz, 3600 San Pasqual St., Pasadena (10). SECRETARY, H. F. Ulovec, 3886 Olympiad Dr. (43).
- **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRESIDENT, R. S. Fullerton, P.O. Box 3697. SECRETARY, J. R. Clark, P.O. Box 1755.
- **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, L. H. Hornor, Jr., 816 Insurance Bldg. SECRETARY, Boone Crisp, P.O. Box 9065, (4).
- **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, Third Thursday. PRESIDENT, M. L. Gollaher, 1163 Roosevelt Ave. (5). SECRETARY, G. L. Soderborg, Sr., 42 E. 8th St. S.
- **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, Third Wednesday. PRESIDENT, H. E. Marquart, 111 W. Main St. SECRETARY, R. L. Burton, Jr., 1913 Lafayette Blvd.
- **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, Second Wednesday. PRESIDENT, G. C. F. Asker, 1109 W. Broad St., Falls Church, Va. SECRETARY, C. P. Humke, 5905 Berwyn Rd., Rt. 1, Box 89, College Park, Md.
- **WEST TEXAS:** 1953. Hdqrs., Lubbock, Tex. PRESIDENT, L. C. McKay, 210 Sanford Bldg. SECRETARY, J. C. Wharton, Box 1240.
- **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets. Second Monday PRESIDENT, F. W. Brundage, 512 N. Park St., Kalamazoo (11). SECRETARY, F. L. Murray, 482 W. Michigan Ave., Battle Creek.
- **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, Second Monday. PRESIDENT, Q. P. Thompson, 260 Richmond Ave. (22). SECRETARY, G. E. Kuhn, 475 Woodland Dr. (23).
- **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, Third Monday. PRESIDENT, L. C. Plaehn, 914 N. Broadway. SECRETARY, H. W. Alyea, 507 E. Michigan St.

SPECIAL BRANCH

- **SWISS:** 1952. Hdqrs., Zurich, Switzerland. PRESIDENT: Walter Sennhauser, Sulzer Bros., Ltd., Winterthur. SECRETARY, Walter Hausler, Erbstrasse 2, Kusnacht, Zurich.

STUDENT BRANCHES

- **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRESIDENT, Norman Falbaum, Box 4668, State College Station. SECRETARY, J. L. Flowers, Apt. 33-E, Vetville.
- **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRESIDENT, C. E Durrett, 1215 College. SECRETARY, R. M Jauch, 308½ W. Maple.
- **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. E. Bulletset, 252 Kings Rd. SECRETARY, I. P. Parkhurst, 1354 Harrison.
- **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, E. B. Katz, 415 State St. SECRETARY, R. A. Chambers, 248 Littleton.
- **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, D. F. Carroll, Box 6264. SECRETARY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.
- **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, First Tuesday. PRESIDENT, J. R. Cairns, 4001 Florence, (21). SECRETARY, W. E. Zimmerman, 15359 Lauder (27).
- **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, First and Third Tuesday.
- **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont. CHAIRMAN, Alexander Tudor, 75 South Dr. SECRETARY, T. M. Devine, More House, St. Michaels College.

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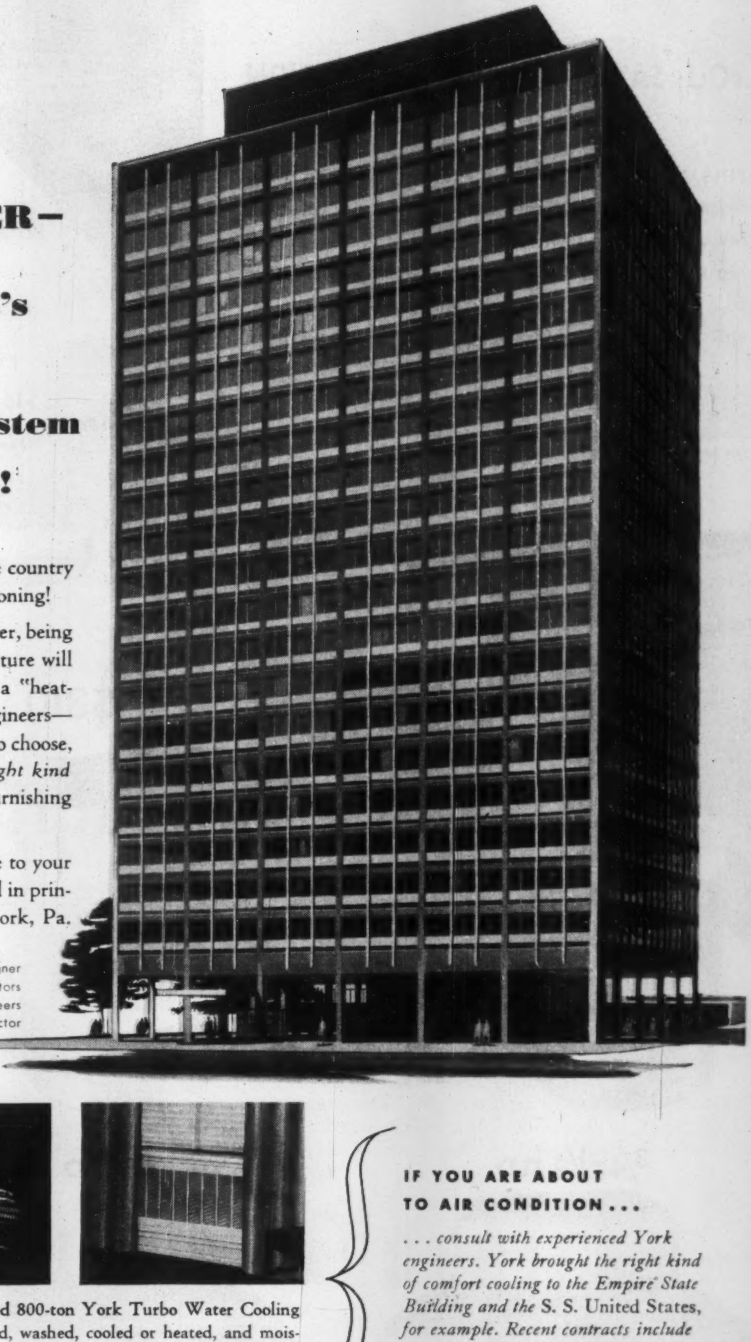

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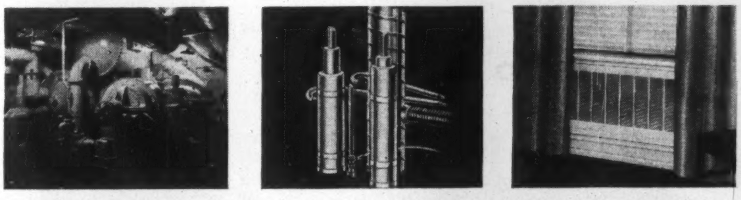

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because these G-E motors weigh up to 50% less.

THIS CHART SHOWS the savings for each 1000 finished products shipped. Depending on how far you ship and which G-E motor your product requires, you can estimate the savings available to you. Add to these any shipping savings resulting from lighter motor mountings or housings.*

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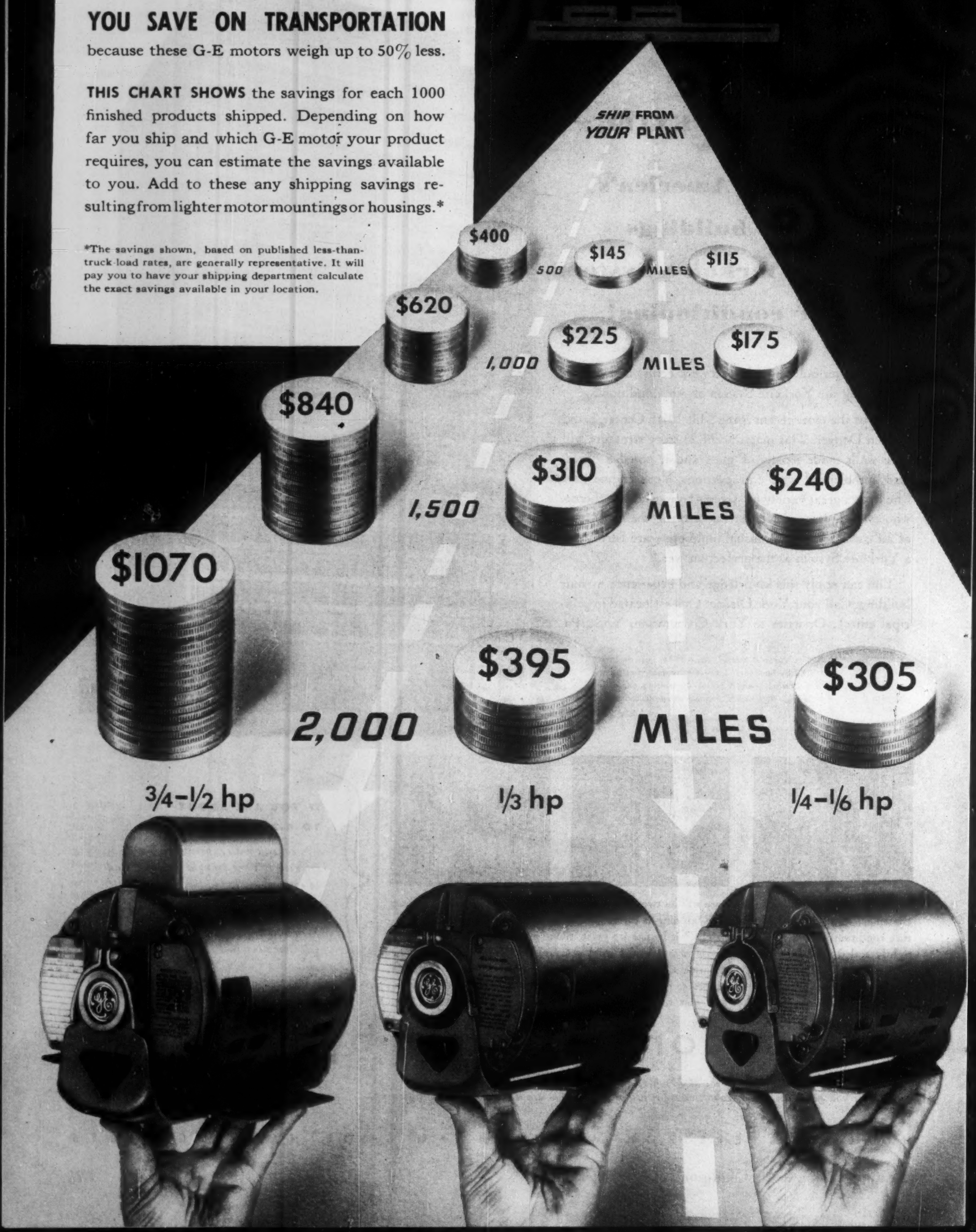
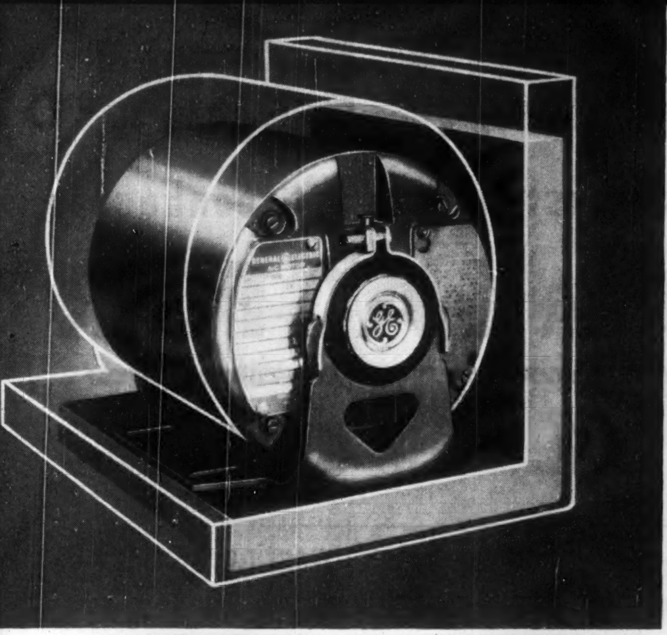
*The savings shown, based on published less-than-truck-load rates, are generally representative. It will pay you to have your shipping department calculate the exact savings available in your location.





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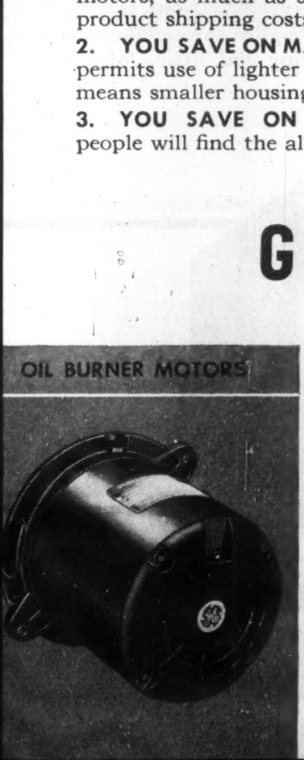
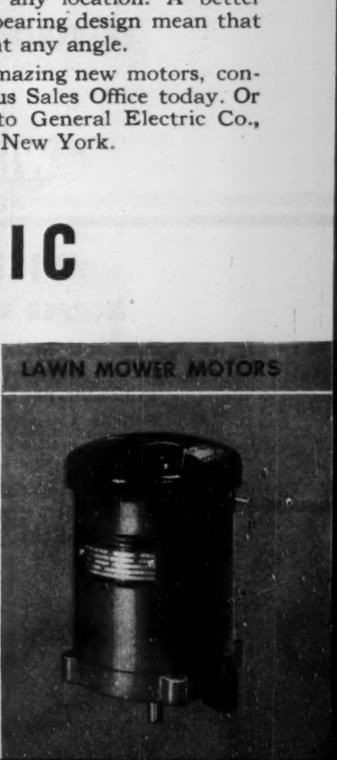


JET PUMP MOTORS



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EFFICIENT COMBUSTION ASSURED UNDER EVER-CHANGING FUEL BED CONDITIONS

Will-Burt Patented Automatic Air Control delivers correct quantities of air for the most efficient combustion of bituminous coal under ever-changing fire bed conditions. The Automatic Air Control assures proper combustion of fuel during the operating period and also during the time the blower and stoker feed screw are off. Air induced by natural draft through the Automatic Air Control when the blower is idle is sufficient to prevent a condition of smoke and soot such as is usually prevalent when the fire is starved for air.

The Will-Burt Automatic Air Control allows enough of the normal draft to pass through and into the retort which in turn allows for the dissipation of any intense heat that may be surrounding the tuyeres or dead plate at the time the blower shuts off. This reduces boiler repair costs by maintaining more uniform boiler and furnace firebox temperatures. Air ports in the tuyere sections are designed to distribute air thoroughly throughout the fire bed and prevent clogging and sifting of fines into the windbox.

Will-Burt exclusive Automatic Air Control assures efficient combustion of bituminous coal during operating and off periods.

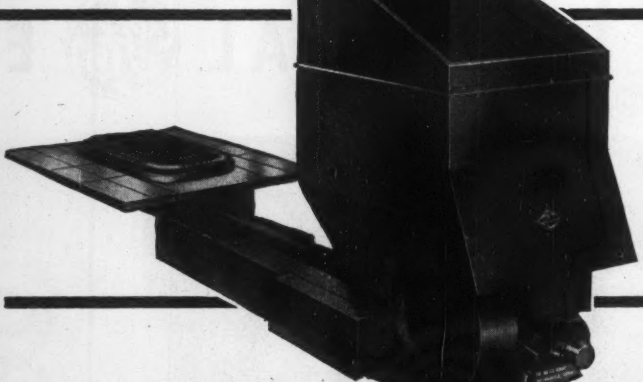
SMOKE AND SOOT PREVENTED

WILL-BURT

WILL-BURT

HOPPER MODEL STOKER

Available in both open and closed models; capacities of closed models 20 to 125 lbs. per hour; capacities of open models 150 lbs. per hour and up to 750 lbs. Will-Burt Stokers provide uniform trouble-free heat for schools, hospitals, institutions, greenhouses, churches, apartments, stores and factory buildings.



The **WILL-BURT** *Company* **Over 20 Years in the**

COST HEATING IN

Country Clubs • Churches • Apartments • Factory Buildings

OF GREATER SAFETY

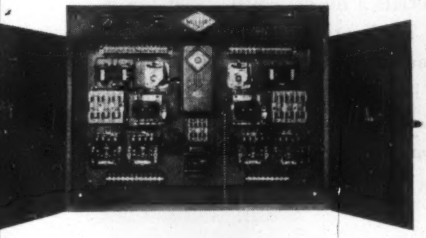
AIR CONTROLLED STOKERS

Your reputation is your priceless asset. Protect it by recommending coal heat where safety is paramount, and win the continuing respect of new customers by installing Will-Burt Air Controlled Stokers

---

A FACTOR OF GREATER SAFETY IN AUTOMATICALLY CONTROLLED HEATING IS ASSURED WITH **WILL-BURT** SAFETY DEVICES

Bituminous coal fired with a Will-Burt Stoker is positively the safest method of heating. Safety in heating is of utmost importance in schools, hospitals and institutions. Will-Burt controls provide limiting and operating controls which may be set to obtain maximum efficiency in use of fuel and coordinating operation of blower, Automatic Air Control and stoker under particular operating conditions. Will-Burt types of controls have been selected from a thorough understanding of what is required to obtain the utmost efficiency in both the stoker and blower operations. Will-Burt Engineers comprehend fully the function of controls in providing *a factor of greater safety for schools, hospitals and institutions.*

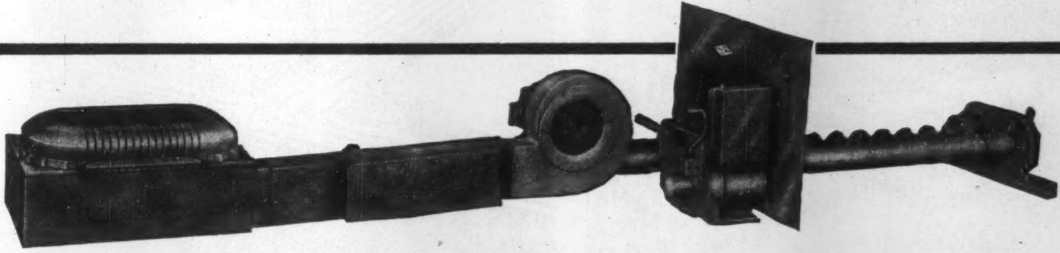


NEW WILL-BURT STOKER CONTROL PANEL COMPLETELY WIRED AND FACTORY-TESTED

Wired in accordance with national electric codes, panel controls include combinations of disconnect switches, selector switches, hold-fire controls, shear pin alarms, and time switch. Stokers are protected at all times by separate individual operating and limit controls, low water cut-offs, and shear pin switches. Available in a standard unit, ready to install and operate.

SAFETY SHEAR PIN AND DISCONNECT SWITCH

If an overload occurs, a protective pin shears. An automatic switch stops the motor and fan. Fire continues at a slow burning rate; the coal screw and burner are not subjected to damaging temperatures. The shear pin is fully exposed and is easily reset without tools. A bell or light signal may be easily installed to indicate a sheared pin.



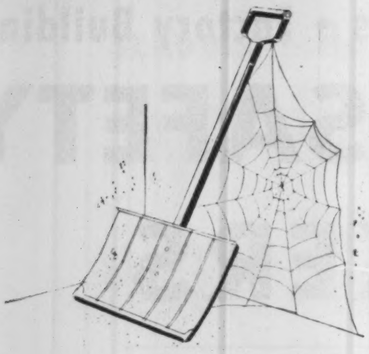
WILL-BURT BIN FED STOKERS FOR BITUMINOUS COAL BURNING BOILERS AND FURNACES

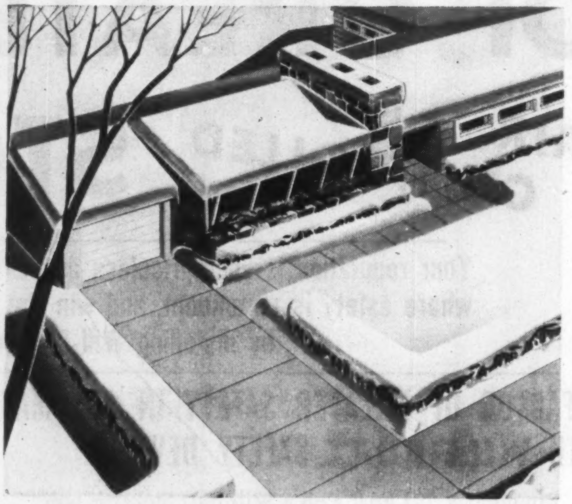
Reduces cost of coal handling and maintenance to an all-time low. Widely used throughout the nation and in several foreign countries for heating schools, hospitals, institutions, etc.

Write for Engineers Reference Manual which includes general stoker data and suggested specifications for Stokers, also installation diagrams for Will-Burt Hopper and Bin Fed Stokers and Will-Burt Control Panels.

BOX 902 • ORRVILLE, OHIO

The old snow shovel's gathering dust



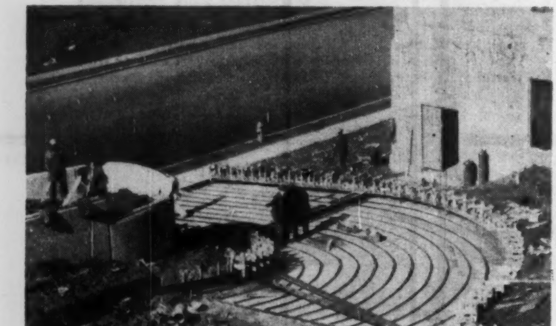


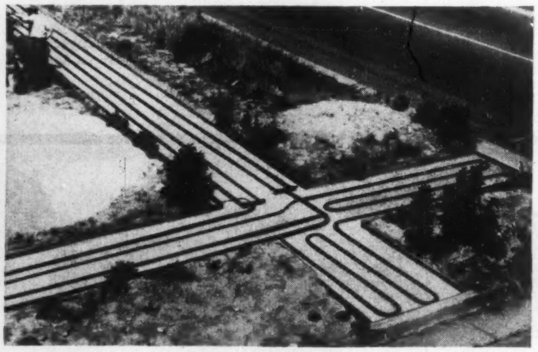
Today's modern snow melting installations have sent many a snow shovel into retirement. In addition to being used for residential sidewalks and driveways, hundreds of snow melting systems have been installed at hotels, office buildings, church entrances, theaters, train platforms, and bus terminals throughout the snowfall areas of the United States.

Besides taking the aching back out of a tiresome winter chore, snow melting systems take the accident and lawsuit hazard out of dangerous, icy sidewalks. Moreover, when used in front of theaters, around department stores and other business establishments, they offer a wonderful psychological advantage. People tend to congregate in these clear areas on bad winter days. Thus, the snow-free sidewalks before a place of business create good will, and the merchandise on display there is seen by large groups of people.

For over 50 years, architects, engineers and contractors have been specifying National Steel Pipe for conventional plumbing and heating systems until it has become the nation's standard for such applications. It is only natural, then, that they should turn to National for this relatively new application—snow melting systems. They know that National Pipe has the inherent characteristics necessary to meet the requirements of such applications — smooth, uniform bending; sound, strong welding properties; and long service life. Small wonder that such confidence has made National Steel Pipe America's largest selling pipe for snow melting service.

WALLS WITHOUT
WELDS



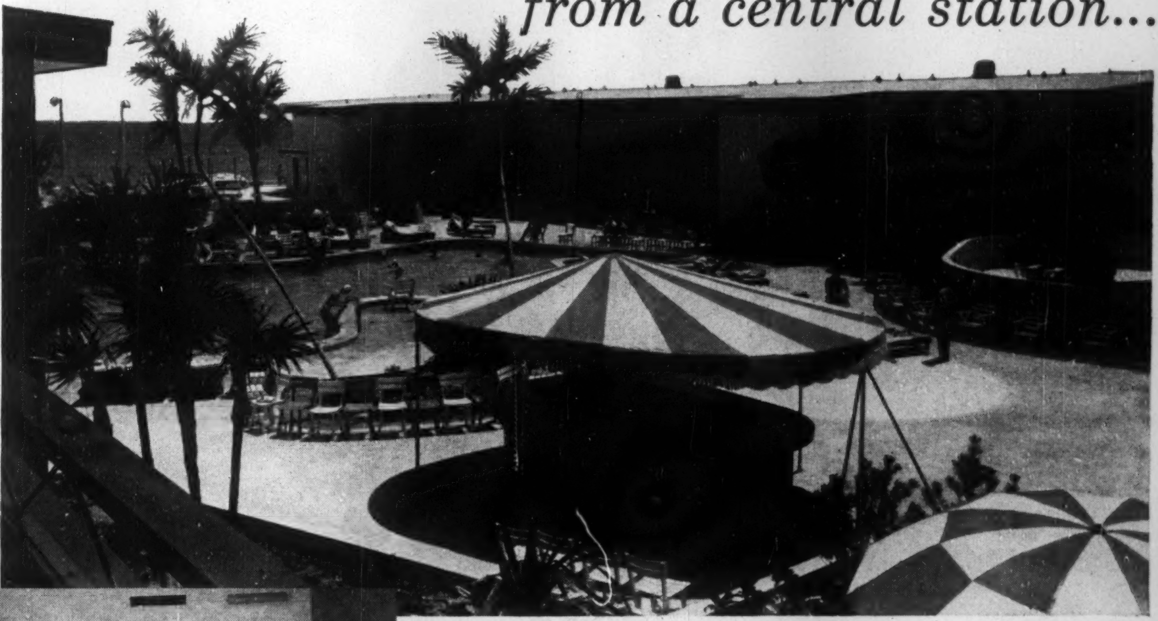


NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S NATIONAL *Steel* PIPE

UNITED STATES STEEL

in this smart miami beach motel
IT'S COOLING + HEATING
from a central station...



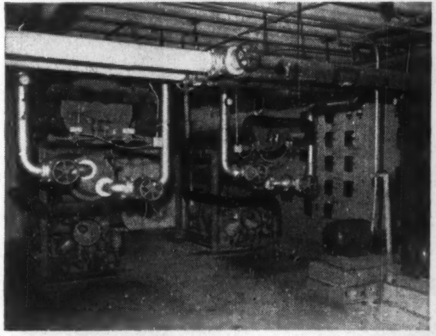
Sahara Motel, Miami Beach, Fla. *President:* Ben B. Gaines. *Architect:* Carlos B. Schoppl

Typical apartment of Sahara Motel, showing outlet (over door) for conditioned air and return air grille. Occupant can adjust thermostat to secure temperature desired, or shut off cooling or heating entirely.

BUT *with individual room control through a specially-engineered* CHRYSLER AIRTEMP SYSTEM!

From a central station comes chilled water for cooling and warm water for heating in the Chrysler Airtemp Year 'Round Air Conditioning at the Sahara Motel in Miami Beach. But there the resemblance to conventional central duct air conditioning ends. The water, cold or hot, according to the season, is *piped* to overhead air conditioning units in each apartment. These self-contained air conditioners distribute cool air or warm air under thermostatic control, giving the occupant his choice of temperature at all times.

Chrysler Airtemp makes precision-built equipment for every type of air conditioning system—conventional or specially-engineered—in a modern air conditioned plant. And through Airtemp Construction Corporation, a wholly-owned subsidiary, offers architects, engineers and contractors a complete air conditioning service. See how this service can make your job easier! Just write Airtemp Division, Chrysler Corporation, Dept. HP, 1600 Webster Street, Dayton 1, Ohio.



Two Chrysler Airtemp "Packaged" Water Chillers from which chilled water for cooling is pumped through small pipes to concealed air conditioners which serve individual apartments.

CHRYSLER AIRTEMP

HEATING • AIR CONDITIONING for HOMES, BUSINESS, INDUSTRY

AIRTEMP DIVISION, CHRYSLER CORPORATION
Dayton 1, Ohio

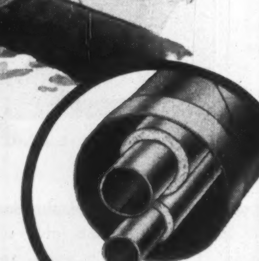
Where a Job Well Done JOINS HANDS

The veteran RIC-WIL field supervisor and contractor join hands in a JOB WELL DONE. Expert field service is available on all RIC-WIL installations.

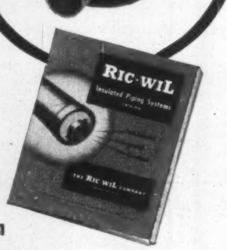
There is satisfaction in achievement . . . the knowledge that *BOTH* the supplier and the buyer have given their best . . . and the best in Prefabricated Insulated Piping for underground and overhead systems is RIC-WIL.

The next time you specify . . . specify Quality . . . specify RIC-WIL.

Write direct for Catalog No. 5401 or contact your local RIC-WIL representative.



RIC-WIL
Multiple Systems



Send for Catalog No. 5401

Quality Piping Systems of the . . .
. . . Highest Mechanical Strength

RIC-WIL PREFABRICATED **INSULATED PIPING SYSTEMS**

THE RIC-WIL COMPANY
BARBERTON, OHIO

5 Peerless Pump Designs

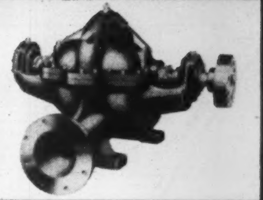
that squarely meet every WATER HANDLING REQUIREMENT

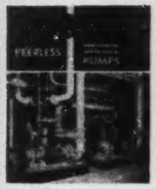
PEERLESS PUMPS

THESE ARE THE *Pumps*

ASK FOR *FREE* ENGINEERING BULLETINS

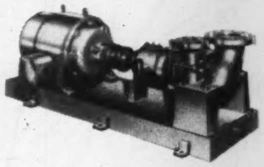
TYPE A AND TYPE AS GENERAL PURPOSE PUMPS
Use these pumps in the widest range of water handling services. Single stage, horizontal split case design. Mechanical shaft seal construction available in sizes up to 4" (Type AS). Heads: up to 300 ft.; capacities up to 70,000 gpm.

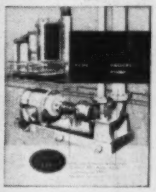




Ask FOR BULLETIN B-1300 & B-1350

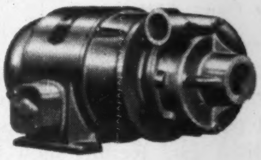
TYPE PR AND TYPE PRS HIGH TEMPERATURE, HIGH PRESSURE PUMPS Horizontal center-line-mount pumps with packing gland or mechanical shaft seal construction. End or top suction designs. Heavy duty pumps for heads up to 675 ft. Capacities: up to 1000 gpm and temperatures up to 850°F.





Ask FOR BULLETIN B-1605

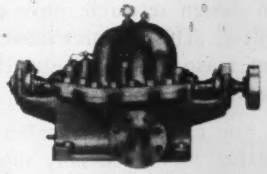
TYPE PE AND TYPE PB END-SUCTION PUMPS
America's broadest line of economical, general purpose pumps. Horsepower range from ¼ to 150. Head range to 260 ft. Capacities up to 5500 gpm. Easy to buy, apply, install and maintain. Tens of thousands in use.

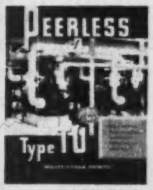


PEERLESS
Fluidyne

Ask FOR BULLETIN B-2300

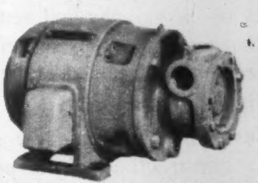
TYPE TU AND TYPE TUT MULTI-STAGE PUMPS
2,3,4 and 5-stage designs for supplying, circulating and boosting water and other liquids in moderate capacities against medium and high heads. Durable and dependable in operation. Heads up to 1660 feet; capacities up to 3000 gpm.





Ask FOR BULLETIN B-1400

TYPE TVE AND TYPE TVB TURBINE VANE PUMPS
For pumping hot and cold, clear and vaporous liquids in small capacities against high heads. Widely used throughout industry for water boosting, circulating, transferring. Easy to install and maintain. Capacities: up to 58 gpm; heads up to 800 feet.



Ask FOR BULLETIN B-2205

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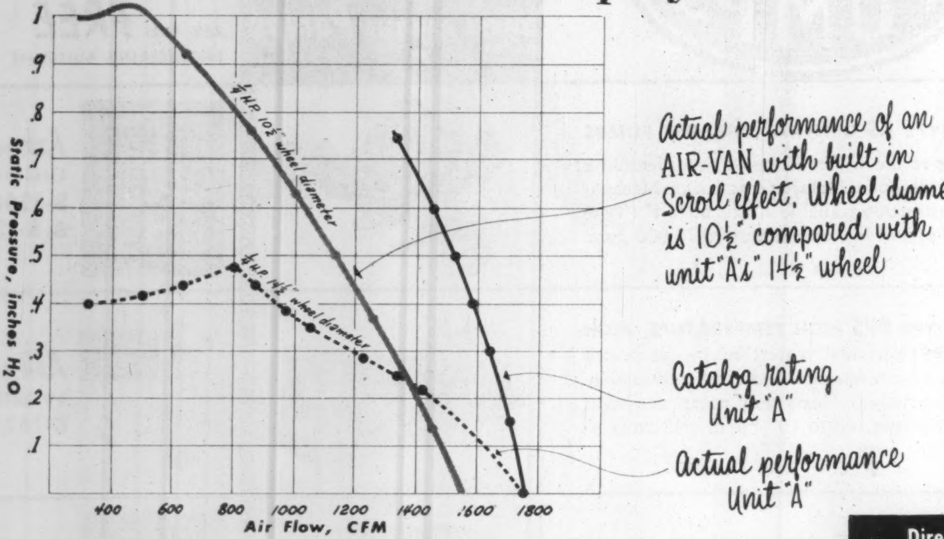
PEERLESS PUMPS

fmc

Here's what we found out about power roof exhausters when rated in *actual physical tests*



Actual performance of an AIR-VAN with built in Scroll effect. Wheel diameter is 10½" compared with unit "A's" 14½" wheel

Catalog rating Unit "A"

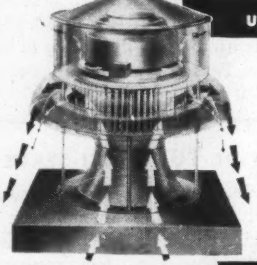
Actual performance Unit "A"

The graph tells the story. When ratings are predicted from a formula, the theoretical performance curve does not hold up against an actual physical test. Results show that other uncalculated factors drastically alter air output. Gallaher Air-Vans which are based on design research, have exclusive, patented, built-in scroll effect. This research indicates that unless scroll effect is present, reasonably efficient performance against even ¼" static pressure is impossible.

Further studies show that you cannot even predict the performance of power roof exhausters when only slight modifications are made in design. Errors may be more than 50%. That's why Gallaher relies on actual physical tests, so that the buyer can be certain that when a unit is supposed to deliver a specified volume against a specified static pressure, you can be sure it will do so.

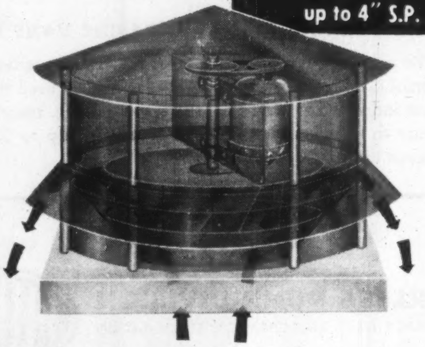
This exclusive feature plus many others — low silhouette, safe fume removal, heavy construction, direct connection, weatherproof design — is why engineers everywhere are turning to Gallaher to solve almost every kind of industrial ventilation problem. For full catalog information write

Direct Drive
100 to 11,000 CFM
up to 4.2" S.P.



Patents 2188741 · 2526290.
Patents pending

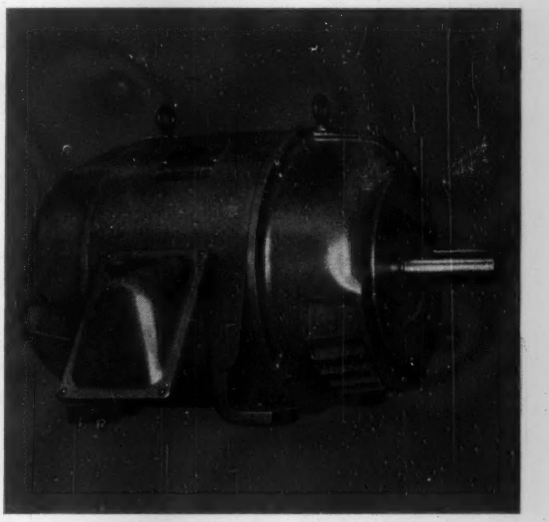
NEW Belt Drive 4000
to 65,000 CFM
up to 4" S.P.



The GALLAHER *Company*

4108 Dodge St. Omaha, Nebraska

"ALL MOTORS ARE NOT ALIKE!"



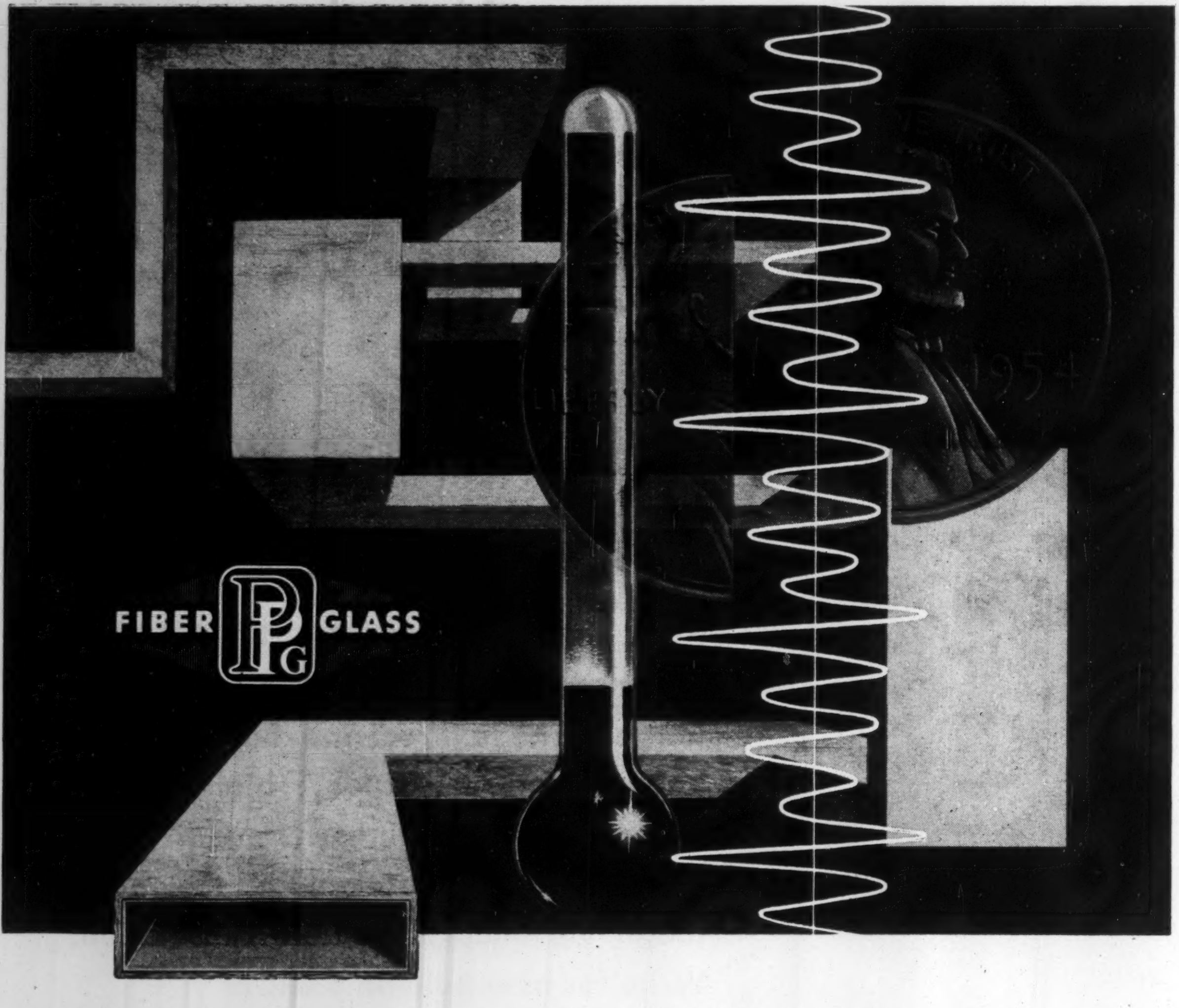
FOR COMPRESSOR SERVICE, Reliance Motors are built better to last longer. These *Precision-Built* Motors have low starting rates . . . high starting torque . . . liberal ratings . . . smooth acceleration . . . quiet operation. And they have tough, vibration-proof Reli-X insulation. Write for new Bulletin B-2102.

RELIANCE
Precision-Built
MOTORS

B-1470-D

RELIANCE ELECTRIC AND ENGINEERING CO.

1052 Ivanhoe Road, Cleveland 10, Ohio • *Sales Representatives in Principal Cities*



New economies in plant ductwork insulation—Pittsburgh Superfine Insulation

Pittsburgh Superfine is so extremely lightweight and easy to install that important thermal or acoustical insulation can be added to your plant's ductwork *in minimum time and at lowest cost.*

Made from exceedingly fine fibers, Pittsburgh Superfine offers maximum thermal insulation for both high or low temperature ductwork, as well as excellent sound absorption qualities in the middle and high frequency ranges. In application, it is easily cut to desired sizes with either knife or shears, fitted to all ductwork shapes rapidly. Pittsburgh Superfine can be applied to ductwork by either adhesives, tapes, cord or wire—or covered with canvas, asbestos, paper or vapor barrier.

For complete information on Pittsburgh Superfine for your plant's ductwork, contact our executive offices or district offices in Chicago, Cincinnati, Cleveland, Detroit, New York or Washington, D.C. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pa.

FIBER PPG GLASS **PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS**

PITTSBURGH PLATE GLASS COMPANY

How Servel Water Chillers
Solve your Cooling Problem

①

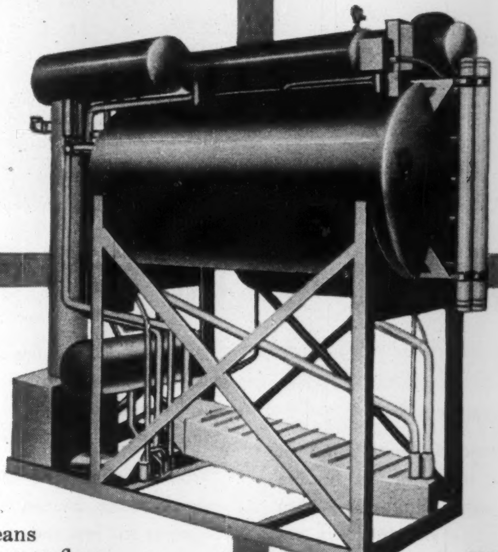
Regardless of cooling needs

The adaptable Servel 25-ton Water Chiller uses water as the refrigerant—provides economical cooling for *air conditioning, process cooling,* or *industrial pre-cooling.* Your Servel dealer can show you performance figures on applications most similar to your needs, in any of the three fields.

②

With the most economical fuel

Steam from the most economical source—gas, oil, LP gas, even *waste* heat—operates the unit, by Servel's exclusive, no-moving-parts *absorption* principle of refrigeration. This wide choice assures you of low operating costs . . . as does Servel's high operating efficiency.



③

Under every installation situation

Light floor loading and vibrationless operation means that no special foundations or floor braces are needed—in penthouse, on individual floors, or in basement. Simple piping, instead of expensive duct work, cuts installation time and costs. Zone control is unusually easy.

④

With exclusive assurance of satisfaction

The Servel Water Chiller cooling system has no moving parts to wear, thus it is quiet and vibration-free. Every Servel Water Chiller is backed by a 5-year warranty. See your Servel dealer or mail coupon for information and engineering co-operation.

MAIL NOW FOR COMPLETE DETAILS!

SERVEL, INC., Dept. HP-74 Evansville 20, Indiana

Please send me complete information on Servel equipment for ☐ Air Conditioning, ☐ Process Cooling, ☐ Industrial Precooling.

Name______________________________

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Servel

the name to watch for great advances in

AIR CONDITIONING ✓ REFRIGERATION

"You've got to use the right club!"

"Par 3—140 yards—plenty of trees—looks like a full 7 iron for me."

"I'd probably be better off with a number 6."

"Funny how identical shots sometimes demand different clubs. Again, the old thing of picking the right tool for the job. It's like we were saying the other day about that condenser tube for Jones & Company—you felt sure we needed a different alloy—and you certainly proved it to our satisfaction!"

"Well, Jack, I think everyone agrees, specialization is a must. For example, one of our products, Wolverine Trufin*, is produced in four different forms—each designed to meet a specialized customer need. One of these four types will handle just about any finned tube job."

"We're using your Trufin Bi-metal in our plant now, Bill."

"That's type L/C. It has aluminum fins and a copper lining. We produce other types that are used in shell and tube heat exchangers and condensers, water heaters and hot air applications."

"You people keep talking one piece construction whenever you mention Trufin."

"We sure do. The fins are literally squeezed right from the tube wall. Because you have the integral construction, the tube retains its higher rate of efficiency through changes in temperature, pressure and vibration."

"Trufin efficiency is another big advantage, Jack. It gives you more surface condensing capacity within a given area and requires far less space to do a bigger job for you."

IF STEPPED-UP EFFICIENCY IS PAR FOR THE COURSE: then you'd better investigate the multi-fold possibilities of Trufin—right now! It's available in copper, copper-base alloys, aluminum and electric-welded steel. And write for a copy of Wolverine's Trufin data sheet. It's a handy thing to have! WOLVERINE TUBE DIVISION of Calumet & Hecla, Inc., 1461 Central Avenue, Detroit 9, Michigan.

*REG. U.S. PAT. OFF.

Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Co., London, Ontario.

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WOLVERINE TUBE

DIVISION OF CALUMET & HECLA, INC.

Manufacturers of Quality-Controlled Tubing

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES.

EXPORT DEPARTMENT, 13 EAST 40TH STREET, NEW YORK 16, NEW YORK

G-E Packaged Units Give Low-cost Air Conditioning in AAA Building

What's the best way to air condition the large building that was never designed for it?

Flexible new General Electric Packaged Air Conditioners provide the answer for A.A.A.'s newly remodeled building in Washington, D.C. Just three G-E units on each floor cool this 30-year-old building. 5, 7½ and 10 horsepower models are used—depending on the space each handles—representing 180 tons in all.

Here's why G-E Packaged Units were selected and why more and more buildings of all kinds are being cooled in this way.

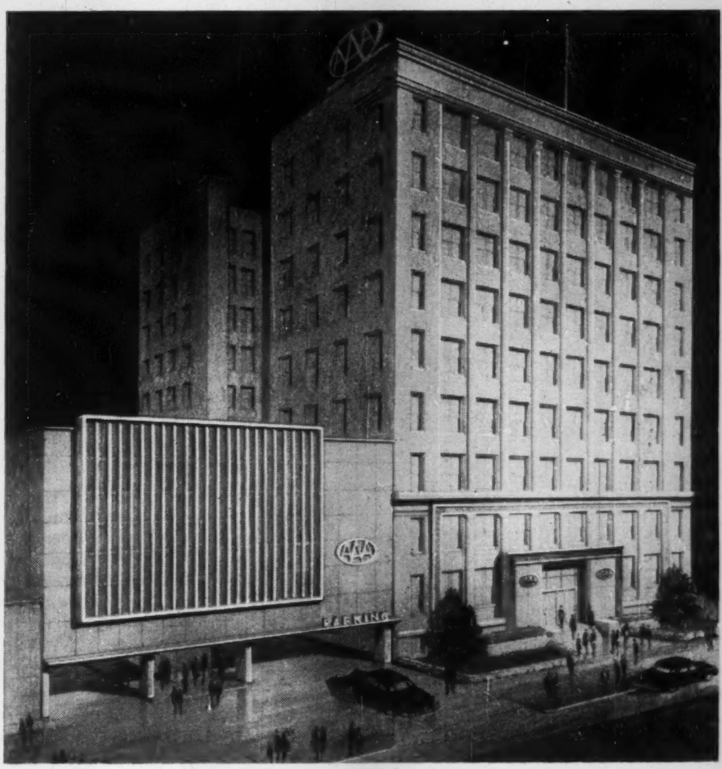
LOW FIRST COST. Equipment is priced surprisingly low. Installation costs are low, too, for remodeling can be held to a minimum. Duct runs are shorter than would be required for a central system. In many applications they are not required at all. No machinery rooms, either.

FIT EVERY APPLICATION. The adaptability of G-E units is unmatched. 3 different sizes were used in the AAA Building, and G.E. makes even more—enough to fit any situation, in-space or out-of-space. They take little floor-space, can be squeezed into corridors and little-used areas.

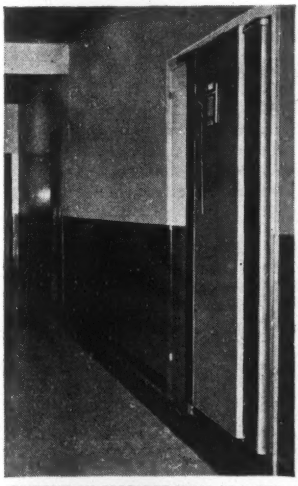
PARTIAL OPERATION. Zoning is simplified. When only part of a building is in use, units in other areas can be shut off, saving money.

G-E 5-YEAR WARRANTY is another advantage over central systems. G.E.'s sealed-in-steel cooling unit is so trouble-free that G.E. provides 5 years' protection (including labor) on the entire refrigeration cycle. Don't forget, with G-E no expensive maintenance crews are needed.

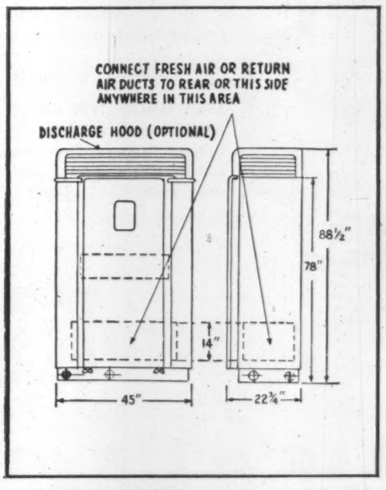
To find out how you can use G-E Packaged Air Conditioners profitably, write General Electric Company, Sec. HP-5, Air Conditioning Division, Bloomfield, N. J.



NEWLY REMODELED American Automobile Association Building in Washington, D. C., is air conditioned by 3 G-E Packaged units on each floor. Architect for remodeling was A. R. Clas; George H. Riggs, Jr., associate. Consulting engineers: Lanier & Levy. General contractor: Wm. P. Lipscomb Co. Mechanical contractor: Morris and Eagan Co.



RECESSED IN CORRIDOR WALL, this 7½-ton G-E unit sends conditioned air to surrounding offices. Air returns through louvers in doors to unit.


CONNECT FRESH AIR OR RETURN AIR DUCTS TO REAR OR THIS SIDE ANYWHERE IN THIS AREA
DISCHARGE HOOD (OPTIONAL)
88½"
78"
14"
45"
22¾"

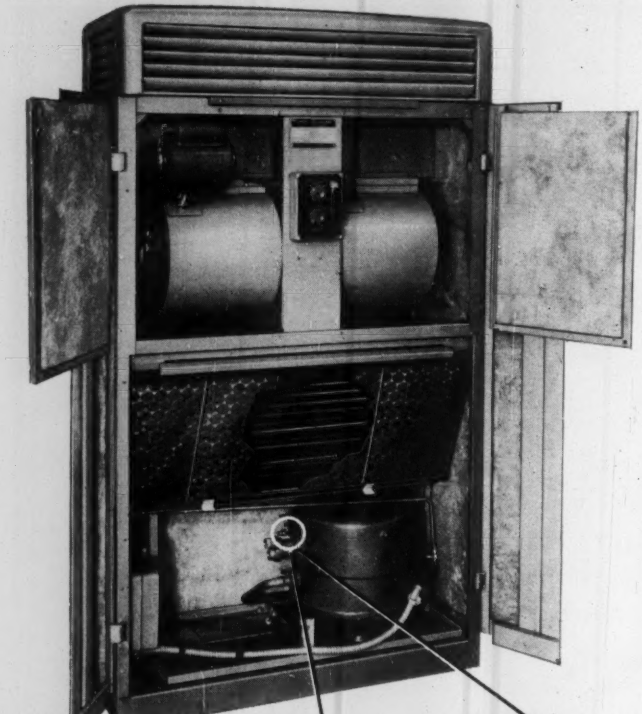
DIMENSIONAL DRAWING of Model FD 75G—7½-ton—G-E Packaged Air Conditioner.

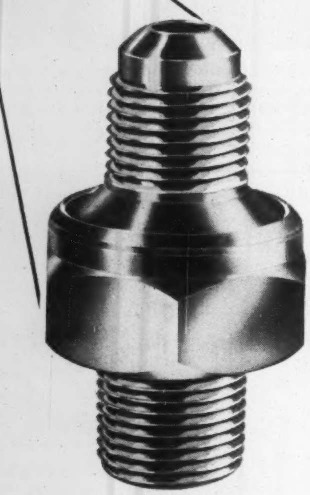
FOR BIG DRAFTING ROOM and other areas, G-E 10-ton unit provides quiet, steady cooling. Individual units like this can be turned off when not needed—others can be left on.

Packaged
AIR CONDITIONERS

GENERAL ELECTRIC

A Small But Important Detail On The G-E "All-In-One" Sealed Cooling System...





The BS&B *Sealed Type* SAFETY HEAD!

General Electric's 1954 line of packaged air conditioners features an "all-in-one" hermetically sealed refrigeration cycle. To meet specific code requirements, this cycle incorporates a tiny safety guardian against loss of refrigerant and damage to the system... the BS&B SEALED TYPE SAFETY HEAD.

This low-priced "throw-away" SAFETY HEAD unit functions much like a fuse in your electrical system, and provides that important *extra margin of safety* at a very nominal cost. Factory assembled and sealed, it consists of a brass fitting containing a fine silver rupture disc which is designed to rupture at a safe predetermined pressure. The entire unit is no larger than a "man's thumb," yet it provides instantaneous and positive pressure relief... and is guaranteed leak-proof.

Chosen by General Electric and other nationally known manufacturers of packaged air conditioners using Freon 12 or Freon 22 as the refrigerant, thousands of BS&B SEALED TYPE SAFETY HEADS are now in service as the primary relief device.

If you are a manufacturer or user of pressure equipment, we suggest that you consider the non-mechanical relief device—the BS&B SAFETY HEAD. Available in a variety of types, pressure ratings and connection sizes. Investigate now! Descriptive literature and prices will be sent without obligation.

CODE ACCEPTED!

BS&B SEALED TYPE SAFETY HEADS comply with the standards established by the ASA B-9 Refrigeration Code and the ASME Unfired Pressure Code. Many cities are now requiring that air conditioning and refrigeration equipment be protected with safety devices which will comply with these code requirements.

BS&B
Safety Heads

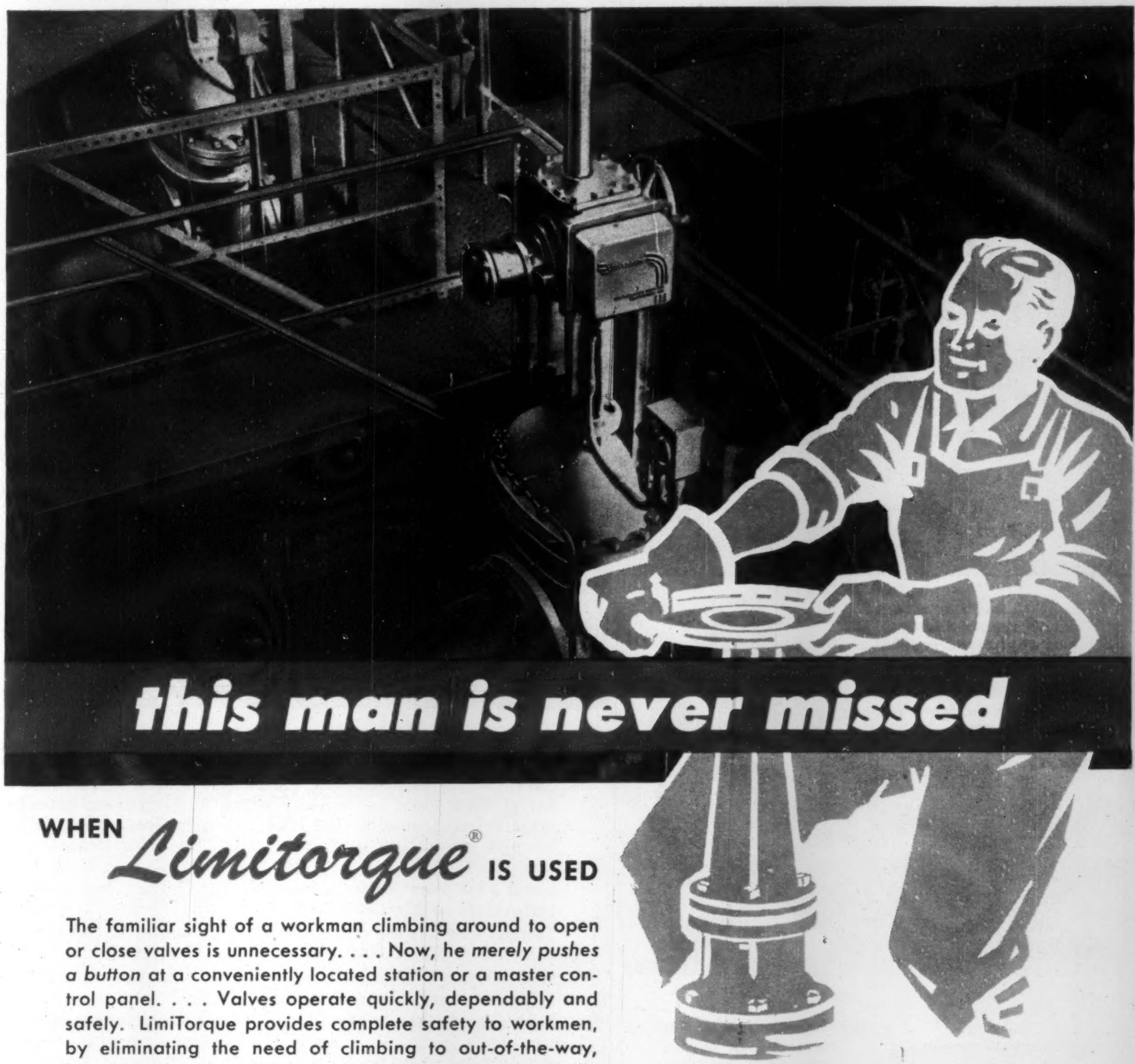
THE "CIRCUIT-BREAKER" OF Pressured Systems

EFFICIENCY
OVER 60 YEARS
BS&B
RELIABILITY

Safety Head Division, Dept. 2-DZ7

BLACK, SIVALLS & BRYSON, INC.

7500 East 12th Street • Kansas City 26, Missouri


this man is never missed

WHEN *Limitorque®* IS USED

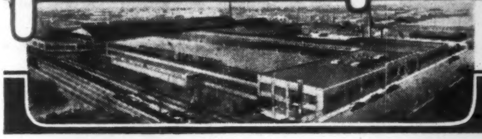
The familiar sight of a workman climbing around to open or close valves is unnecessary. . . . Now, he *merely pushes a button* at a conveniently located station or a master control panel. . . . Valves operate quickly, dependably and safely. LimiTorque provides complete safety to workmen, by eliminating the need of climbing to out-of-the-way, hazardous locations for manual valve operation; also vitally important, valve operation parts are protected from damage by the automatic shutting-off of the motor if an obstruction is encountered. LimiTorque may be actuated by any available power source . . . electricity, air, water, gas, or oil.

Thousands of LimiTorques are in daily use, in Power Plants, Water and Sewage Plants, Chemical and Process Plants, Paper Mills, Oil Refineries, Oil and Gas Pipe Lines, —and on Shipboard. LimiTorque Motor Operated Valves are readily adapted to Microwave Control.

LIMITORQUE CONTROL

Write for LimiTorque
Catalog L-54
for further details.

Philadelphia Gear Works, INC.



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Industrial Gears and Speed Reducers
LimiTorque Valve Controls

If your business is insulating ducts, here's important news:

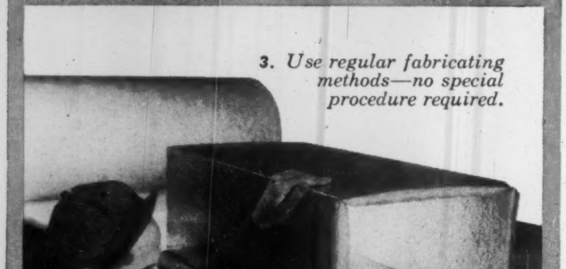
New MICROLITE Duct Liner

coated or
uncoated

a wonderfully soft, light weight, highly manageable glass fiber insulating material with excellent acoustical and thermal properties

1. With knife or shears cut off required length and apply with regular adhesive to sheet metal.

2. Form insulated duct section in the brake in the usual way.



3. Use regular fabricating methods—no special procedure required.

Now, Glass Fibers Inc. brings you a duct liner that is a pleasure to handle and install, and is a highly efficient acoustical and thermal insulator. Chalk up another achievement for Glass Fibers' exclusive Electronic-Extrusion process, which makes possible the long, uniform fibers responsible for the insulating and mechanical superiorities of this new duct liner.

Sound Absorption Value is excellent: ½″ liner has a noise reduction coefficient of .60; 1″ of .75.

Thermal Qualities are also excellent: "k" value of .20 at 50°, .21 at 75°, .23 at 100°, .27 at 150°, .31 at 200°.

Light Weight: 1″ liner with coating on one side weighs less than 2¼ ounces per square foot.

Air Erosion Resistance: Microlite coated duct liner is recommended for air velocities of 1500 feet per minute or over. For movements up to 1500 feet per minute, uncoated will perform satisfactorily.

Can Be Formed in Brake: Cut required length with knife or shears; apply to sheet metal with adhesive; insulated duct section can then easily be formed in the brake. On large ducts, upper surface of horizontal runs should be applied with adhesive plus mechanical clips.

Ready Made Ducts and Fittings: Microlite duct liner can be installed by the "wrap-in" method, using regular adhesives. Precision cutting and fitting of separate pieces, as in the use of rigid insulation, is not necessary.

Microlite Duct Liner is available in 24″, 36″ and 48″ widths; half inch in 200 foot rolls; one inch in 100 foot rolls.

For a technical bulletin and sample, and name of your nearest distributor, write to Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

VITRON Glass Textile Yarns • Rovings • Micro-Fibers
DURAMAT Vapor Barriers • **BLUE FLAG** Pipe Wrap
MICROLITE Thermal and Acoustical Insulation
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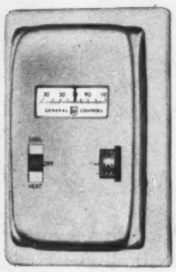
COUSTIC-AIRE and **THERMO-JET** Aircraft Insulations

GLASS FIBERS *INC.*

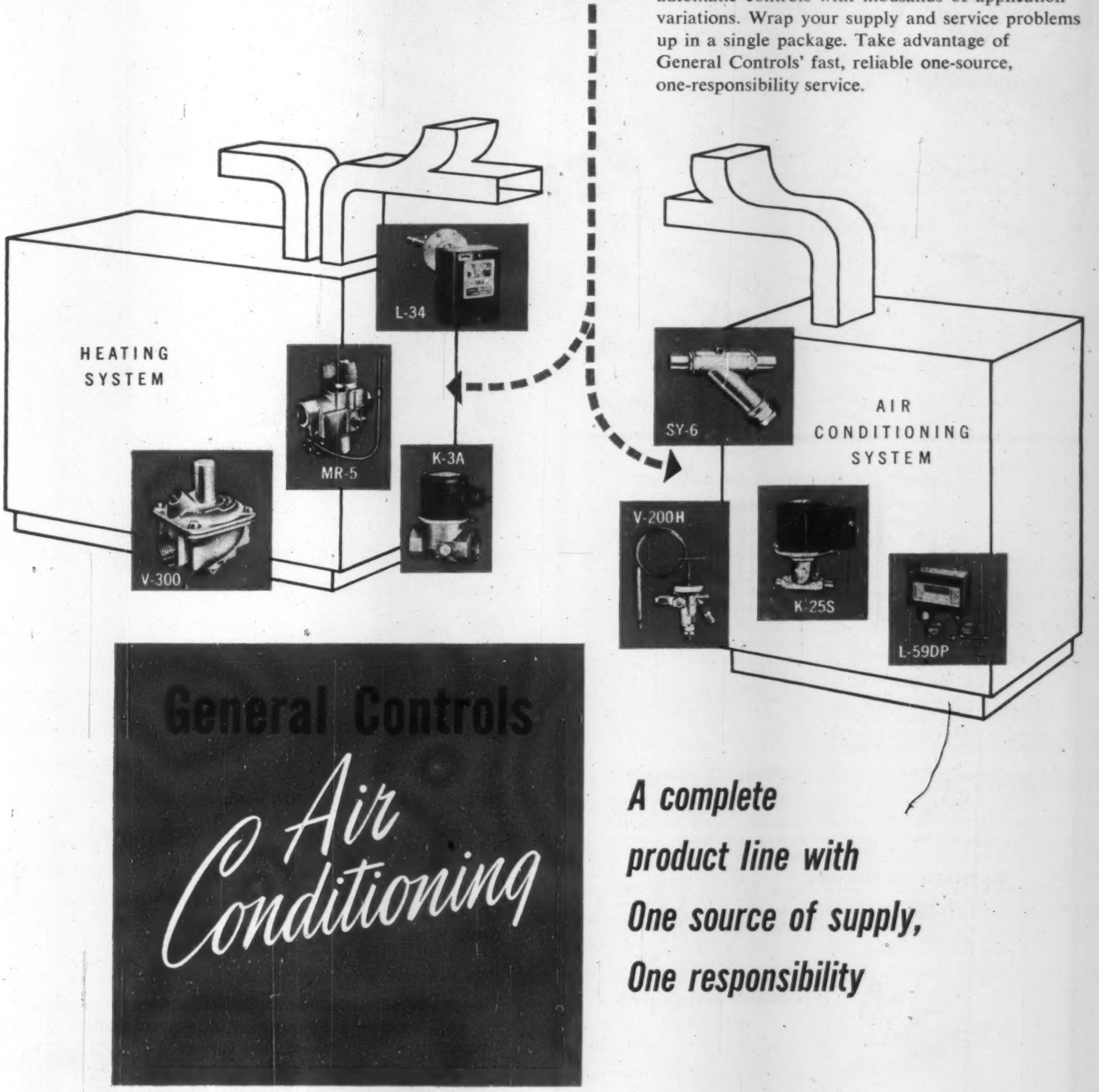
Makers of glass fibers by the ELECTRONIC-EXTRUSION process
. . . developed, patented and used exclusively by Glass Fibers Inc.

packaged control

for combination heating and cooling systems



Year around comfort is available to your customers in General Controls' T-70H room thermostat. This versatile instrument maintains even, healthful warmth when the weather's cold and air-conditioned coolness when it's hot. Investigate General Controls' complete line of automatic controls for residential heating and air cooling systems: room thermostats, fan or limit controls . . . automatic gas valves . . . safety controls, pressure regulators . . . and B-60 self-powered all-gas control systems. Thermal expansion valves . . . pressure and temperature switches . . . magnetic stop valves . . . strainers . . . many basic types of automatic controls with thousands of application variations. Wrap your supply and service problems up in a single package. Take advantage of General Controls' fast, reliable one-source, one-responsibility service.



A complete product line with One source of supply, One responsibility

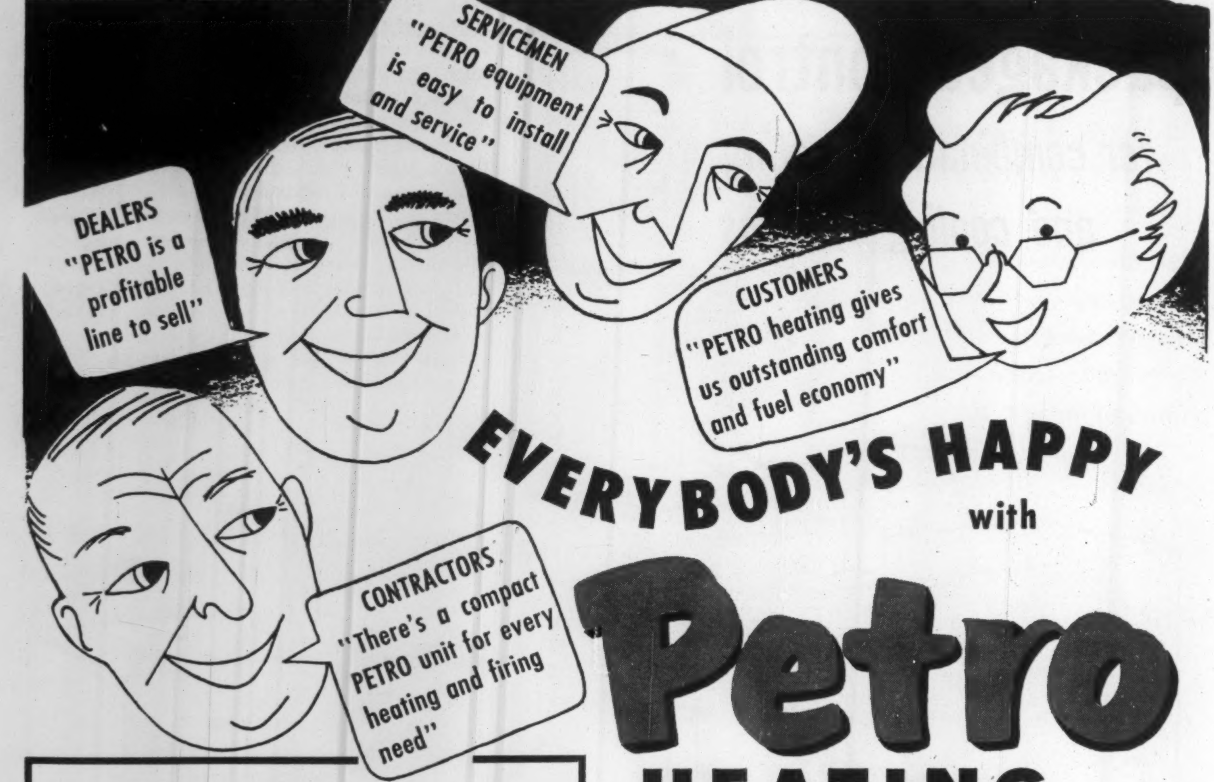
General Controls

Air Conditioning

GENERAL CONTROLS

Plants in: Glendale, Calif., Burbank, Calif., Skokie, Ill.
Factory Branches in 38 Principal Cities
SEE YOUR CLASSIFIED TELEPHONE DIRECTORY

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.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"PETRO equipment is easy to install and service"
DEALERS
"PETRO is a profitable line to sell"
CUSTOMERS
"PETRO heating gives us outstanding comfort and fuel economy"
CONTRACTORS
"There's a compact PETRO unit for every heating and firing need"

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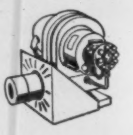
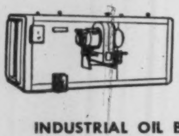
RESIDENTIAL OIL AND GAS FURNACES

Complete winter air conditioners made in popular sizes to fit the heating needs of homes from 4 to 10 rooms. Extremely compact and attractive. Real fuel-savers. Both Highboy and Lowboy models available. Lowboy shown above.

CONVERSION BURNERS OIL OR GAS



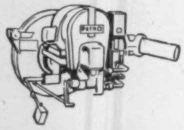
Efficient units for converting your present furnace or boiler to automatic heat. Low in cost and real fuel savers. (Oil unit shown.)



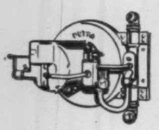
HORIZONTAL OIL FURNACE

Hang it or hide it—this winter air conditioner fits anywhere. Available in 5 models from 80,000 to 180,000 Btu's (output at bonnet).

INDUSTRIAL OIL BURNERS



Horizontal Rotary cup type oil burners for cold, heated, or tempered oils. Capacities up to 200 gallons per hour.



COMBINATION OIL-GAS BURNERS

This commercial industrial burner is the answer to seasonal fuel shortages. Makes possible advantages in economical fuel buying.

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Cleveland 11, Ohio, or in Canada:
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IT'S A FACT—Petro heating equipment is built to *satisfy!* Contractors and dealers appreciate the complete line from which to choose; they appreciate the "customer confidence" that has been built-up over the past 51 years. Service men like the compactness, simplicity, and easy access to connections and working parts which Petro equipment offers. Customers are enthusiastic about Petro's outstanding performance, low fuel costs, and long trouble-free service.

YES, everybody's happy with Petro heating. It's profitable to install—easy to service—economical to own. Write today for complete information.

Residential Oil and Gas Burners, Oil and Gas Furnaces and Boilers, Industrial and Commercial Oil, Gas and Oil-Gas Combination Burners

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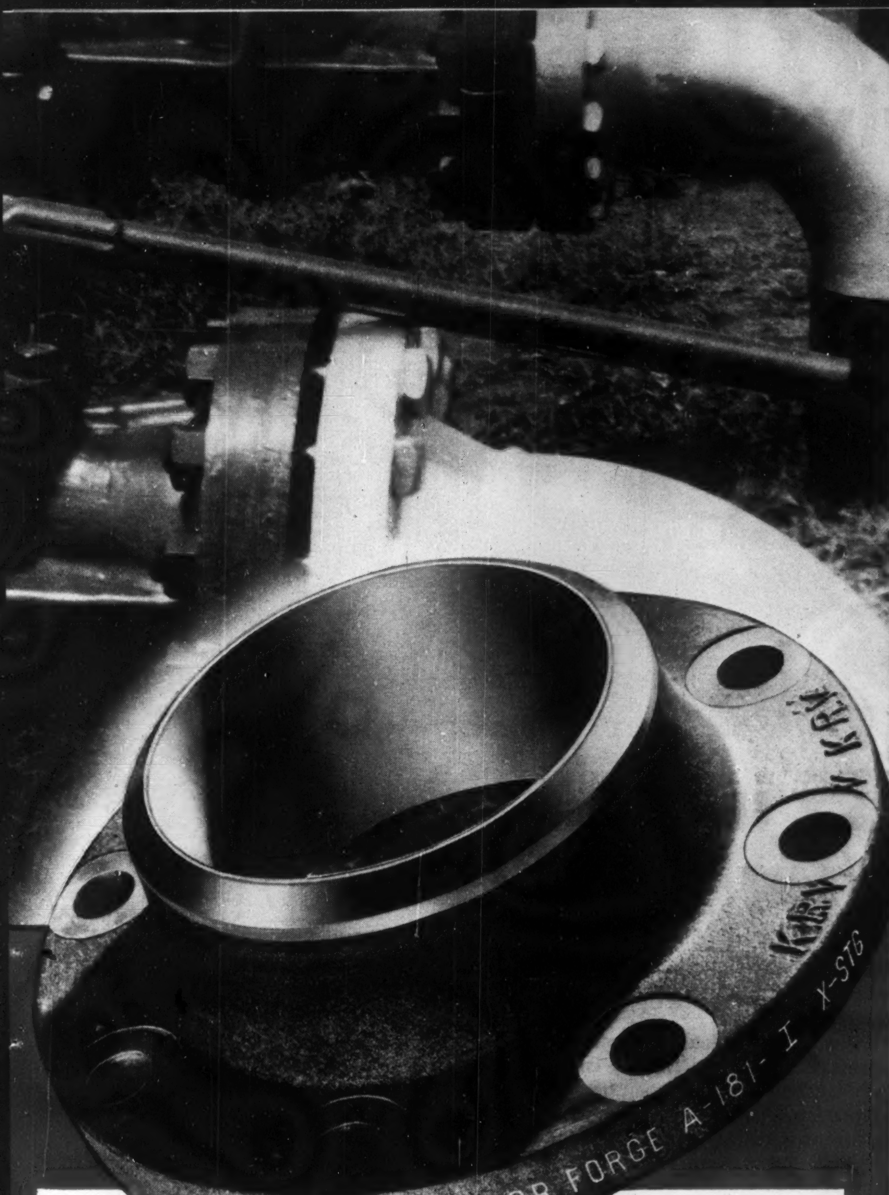

First in flanges—

No organization has been so closely identified with the development of forged steel flanges as Taylor Forge. No organization or individual has had so much to do with the study of design, strength, bolting practices, and the establishing of flange standards.

Taylor Forge started first and has remained first . . . in scope of flange types, sizes, weights, and materials . . . in volume produced.

See your Taylor Forge Distributor for up-to-the-minute facts.

TAYLOR FORGE

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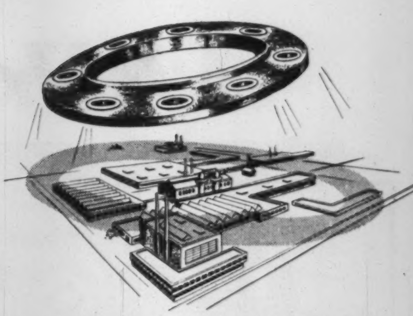
Offices in all principal cities • **Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada**



A flange with a future—

Even though no one knew it at the time, the year 1905 was a significant year for Taylor Forge.

It was the year that Taylor Forge began the making of forged steel flanges.

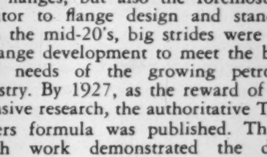
The beginning was modest enough. Taylor Forge simply started out to make flanges for Taylor Spiral Pipe because the only flanges then available — cast iron flanges—had proved unsatisfactory. But it was soon apparent that the men at Taylor Forge had built better than they knew. In just a few years, the new and stronger Taylor Forge Flanges were in demand everywhere—not just for Taylor pipe, but for all types of pipe used by U. S. industry.

It was also apparent that the forging of flanges had taken Taylor Forge into the dawning field of designed piping. Pressures were beginning to climb. Knowledge of how to contain them was needed. By 1920, the late J. Hall Taylor and his associates began the intensive research that was to make Taylor Forge not only the world's largest manufacturer of forged steel flanges, but also the foremost contributor to flange design and standards.

In the mid-20's, big strides were made in flange development to meet the broadened needs of the growing petroleum industry. By 1927, as the reward of long, intensive research, the authoritative Taylor-Waters formula was published. This research work demonstrated the design advantages of the hub type flange and provided the means for producing flanges accurately proportioned for strength combined with economy.

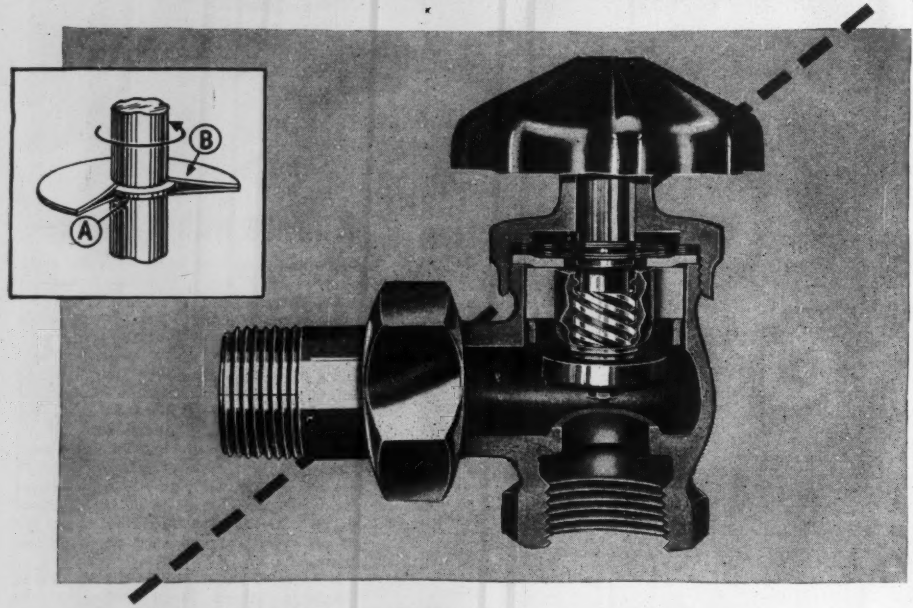
Most of this research had been concerned with the American Standards—flange sizes through 24"—but in 1938 Taylor Forge published the first edition of its widely consulted "Modern Flange Design," based on methods proposed by E. O. Waters, D. B. Rossheim, D. B. Wesstrom and F. S. G. Williams, manager engineering standards, Taylor Forge (ASME Trans. Apr. 1937). It provided the first complete analyses of the effects of tapered hubs on flange strength and thus opened the way to predetermine design requirements of flanges of all types.

(An episode in the story of Taylor Forge leadership in designed piping)



Forty years of research made this book possible. It is available to those interested in flange design.

A Valve that is



PACKLESS in fact

. . . not just packless in name

When the job calls for the kind of valve that will stand up across the years —when it calls for a valve that is packless in the full meaning of the word— then, no matter how far you look, you'll find in the Marsh Packless the only valve that completely fills the bill.

In fact, many users consider this the only valve that is packless in fact as well as in name, and they have a good reason for this. There is a difference between pack less and packless! The diagram tells the story of Marsh truly packless construction. A collar (A) is machined on the valve stem. The stainless spring steel wafers (B) press against this collar to form a tight annular seal This, you see, is a metal-to-metal seal—*permanently* leakproof.

And this better construction is typical of the quality and refinement found throughout the Marsh Packless Valve—in the swivel, self-seating, self-cleaning disc—in the excellent proportioning, machining, workmanship and finish.

Packed valves can and do "blow out", scalding or burning the operator. This danger is avoided when you use the Marsh Packless. It is a valve you can rely on for any service up to 100 lbs. Furnished in a wide range of patterns including graduated and extended stem types, the Marsh Packless Valve is widely used for steam and hot water heating systems, coffee urns, steam kettles, sterilizers, ovens and similar services. Ask our representative or engineering department for facts.

MARSH HEATING EQUIPMENT CO. *Sales affiliate of Jas. P. Marsh Corporation*

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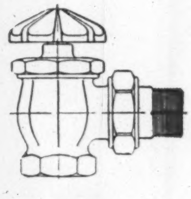
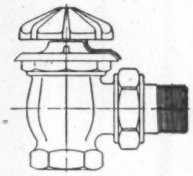
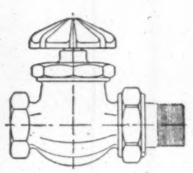


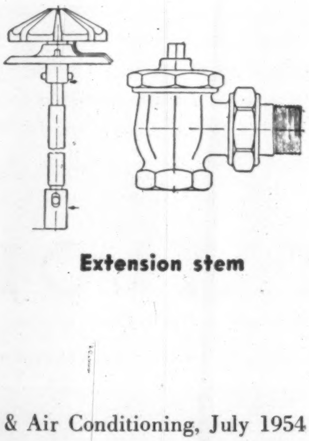
Wheel Angle



Wheel Angle Graduated

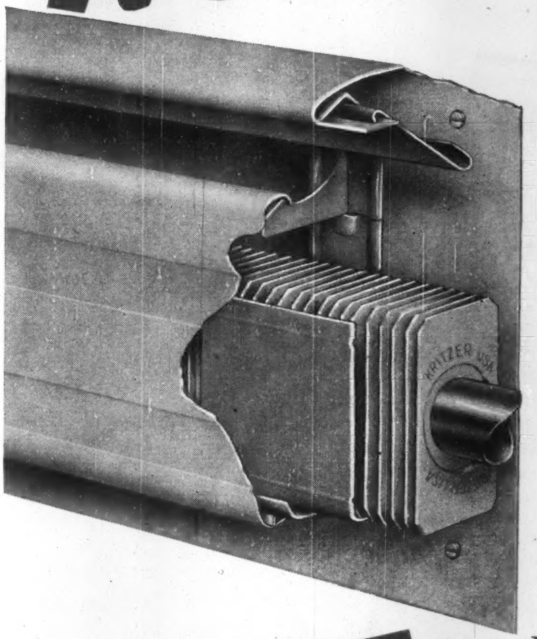


Globe



Extension stem

NOW more profits for you with the KRITZER "K" LINE RADIANT BASEBOARD



Modern design

Easy to install

Exclusive features

Rugged construction

You can profit from this NEW, sturdy, lower cost baseboard for all residential and apartment heating.

Profit from Kritzer engineering that has made the "K"-Line easiest to install.

Profit from the strong horizontal lines that add beauty to any home.

Profit from rugged construction which assures a lifetime of carefree comfort.

Profit from Kritzer's exclusive features such as the snap-in Coil and Top Support Brackets; the Slide Cradle which moves with the coil as it expands and contracts, preventing damage and insuring quiet operation; the Damper with no hinges, chains, or springs; and the Direct Action Damper Control.

Profit from the experienced designing which makes all Kritzer products highest in quality yet lowest in total installed cost.

Profit by building your reputation with Kritzer Radiation.

For further information on the "K"-Line or other Kritzer products call or write: Kritzer Radiant Coils, Inc., 2901 Lawrence Avenue, Chicago 25, Illinois.

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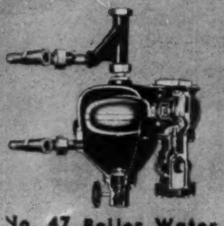
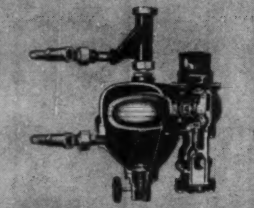
KRITZER

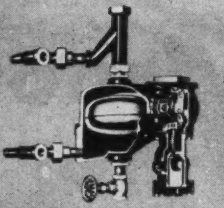
IF IT'S KRITZER, IT'S RIGHT, SIR!



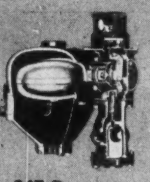
No. 47 Boiler Water Feeder — for hand-fired steam heating boilers up to 5000 sq. ft.



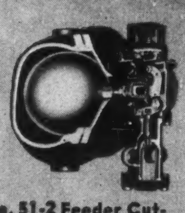
No. 47-2 Feeder - Cut - off Combination for automatically fired steam heating boilers up to 5000 sq. ft.



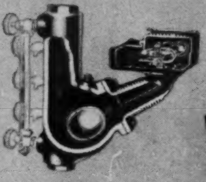
No. 147 Feeder Cut-off Combination — similar to No. 47, but with higher feeding level for small process boilers.



No. 247-2 — same as No. 47-2, but for installation with 1" equalizing pipes.



No. 51-2 Feeder Cut-off Combination — for automatically fired heating boilers over 5000 sq. ft.



No. 157 Water Column Type High Pressure Pump Control, Cut-off and Alarm—for boilers of any size up to 150 lbs. pressure.

McDONNELL PRODUCTS you should know

It isn't likely you'll ever use all these McDonnell Products. But for those special jobs that do come up it's good to know that McDonnell offers liquid level controls, flow switches and similar products for practically every need. Many of them are shown here. For full information on these and the complete McDonnell line-up —

Write for complete new catalog

McDONNELL & MILLER, Inc.
3500 N. Spaulding Ave., Chicago 18, Illinois

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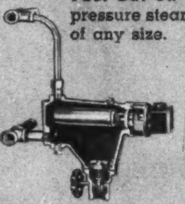
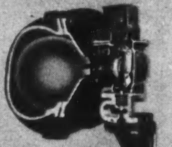
SAFETY CONTROLS

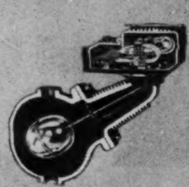
Your Dealer Stocks Them



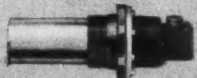
No. 67 Low Water Fuel Cut-off—for low pressure steam boilers of any size.



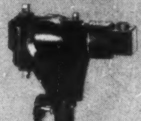
No. 53-2 Feeder Cut-off Combination — Similar to No. 51-2, but built for higher pressure, up to 75 lbs.



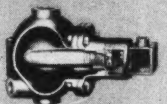
No. 150 High Pressure Pump Control, Cut-off and Alarm—for boilers of any size up to 150 lbs. pressure.



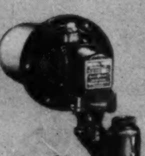
No. 69 "Built-in" Low Water Cut-off — Typical of many "built-ins" for installation in tappings provided in modern boilers.



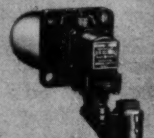
No. 767 Low Water Fuel Cut-off — (with No. 14 blow-off) for easy installation into opening in boiler.



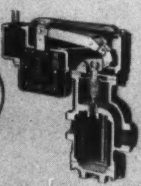
No. 61 Low Water Fuel Cut-off — for 1" equalizing pipe installation on low pressure steam boilers.



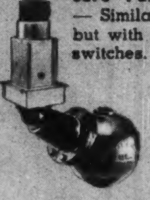
No. 21



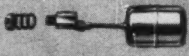
No. 121



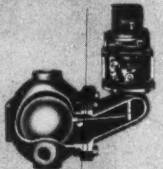
No. 101 Electric Water Feeder— operated by No. 67 or liquid level switches.



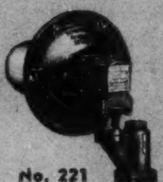
No. 154 High Pressure Pump Control — Similar to No. 150, but with open contact switches.



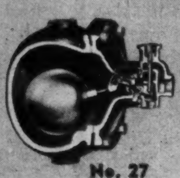
No. 18 Float Valve — for maintaining water level in humidifier pans and many other liquid level control jobs. Also available in float chamber with cover, as No. 518.



No. 63 Low Water Fuel Cut-off — for heating boilers up to 50 lbs. pressure.

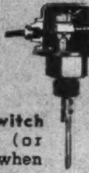


No. 221

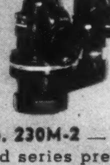


No. 27

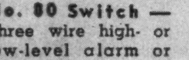
Make-up Water Feeders — to maintain adequate water supply in receiving tanks. Nos. 21, 121 and 221 are installed right in tank openings; available in various flange forms and sizes as shown to fit existing openings. No. 27 is for external application, with equalizing piping.



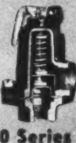
No. E-2 Flow Switch — Completes (or breaks) circuit when flow starts or stops.



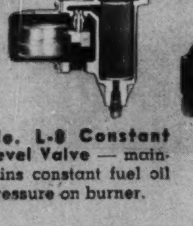
No. 230M-2 — Manifold series pressure relief valve for large hot water boilers. Btu-rated. ASME standard.



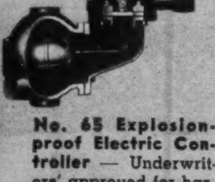
No. 80 Switch — Three wire high- or low-level alarm or pump control on oil storage tanks.



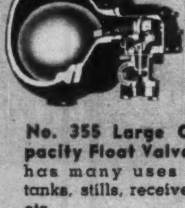
No. 230 Series Pressure Relief Valves— for hot water boilers and hot water tanks. Btu-rated. ASME standard.



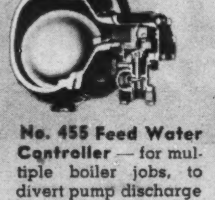
No. L-8 Constant Level Valve — maintains constant fuel oil pressure on burner.



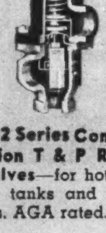
No. 65 Explosion-proof Electric Controller — Underwriters' approved for hazardous locations.



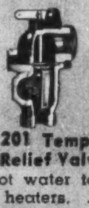
No. 355 Large Capacity Float Valve— has many uses on tanks, stills, receivers, etc.



No. 455 Feed Water Controller — for multiple boiler jobs, to divert pump discharge into proper boiler.



202 Series Combination T & P Relief Valves—for hot water tanks and heaters. AGA rated.



No. 201 Temperature Relief Valve— for hot water tanks and heaters. AGA tested, rated and listed.

Printed in U.S.A.

GREATEST ADVANCE IN AIR CLEANING ECONOMY

These precision stamped filter openings make possible EVANS PRECISION AIR CLEANING.

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LOWEST OPERATION AND MAINTENANCE COST PER LB. OF AIRBORNE DIRT REMOVED

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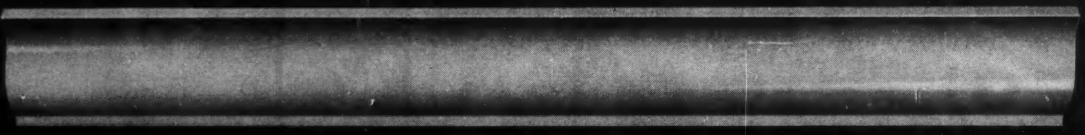
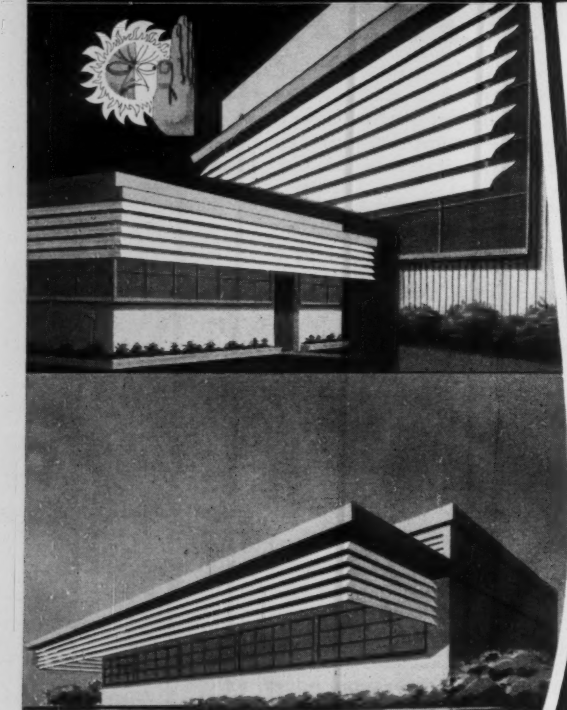


New, Profitable Sun-Control Product by Kawneer



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Get into this profitable business now. K-Louvers are a natural supplement to air conditioning. They are stationary, "built-in" louvers that take the sun heat-load off windows. That means less work-load on the air conditioning system, and helps keep even temperatures throughout the building. Your customer saves on operating and maintenance costs, and on initial costs in new installations. On-the-job fabrication of K-Louvers is quick and easy and there are no maintenance problems. To learn more about this profitable business and a K-Louver dealership, write today to Kawneer, Niles, Michigan.

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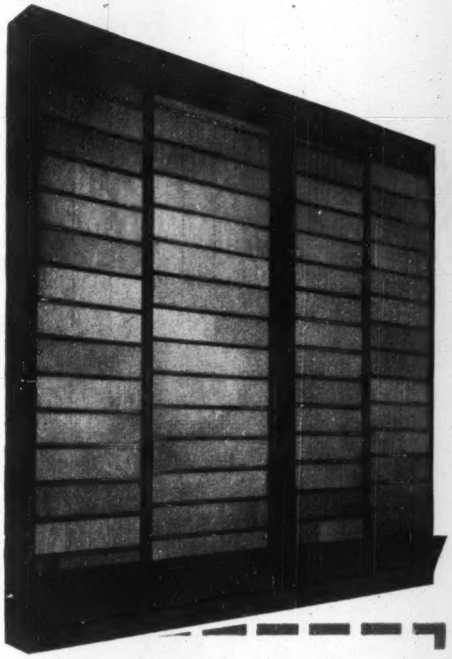

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Installation list of Continental Automatics ☐

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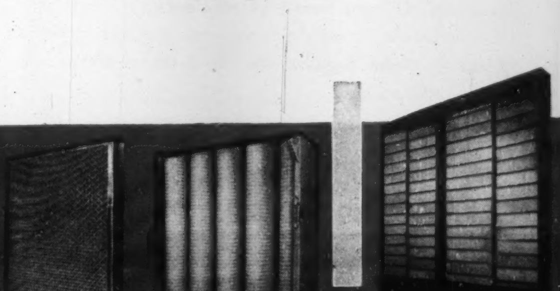

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SUPERIOR STEAM GENERATORS are the ideal source of steam for heat or process. Completely *factory assembled,* and *factory tested* to insure capacity operation at thermal efficiencies guaranteed to exceed 80%, they are backed by undivided responsibility. Installation is simple and inexpensive. Rugged and compact, they need no special foundation, fit in limited space with low overhead.

Superior's *built-in* induced draft eliminates the need of an expensive chimney and avoids the forcing of combustion gases into the boiler room.

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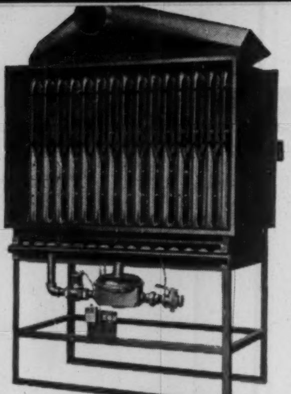
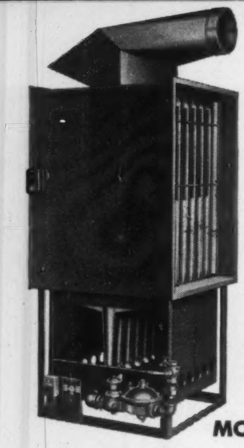
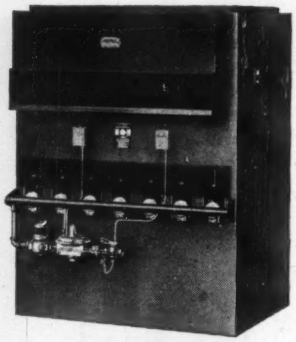


MODEL SED-E



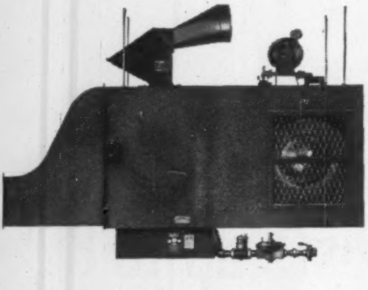
MODEL SED-S



MODEL SED-VF

MODEL SED-E — Non-corrosive type 321 stainless steel heat exchanger. Permits installation downstream of cooling equipment, for continuous blower operation. Air throughput in either direction. 80,000 to 600,000 Btu input.

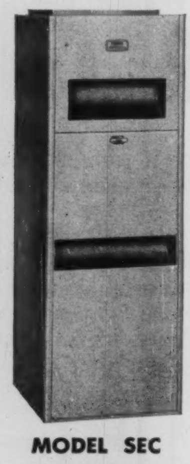
MODEL SED-S — Same as SED-E except controls are at the side, instead of at the end where accessibility requires either SED-E or SED-S is available in sizes from 80,000 to 600,000 Btu input in increments of 40,000 Btu.



MODEL SEU

MODEL SED-VF — Tested and approved as a duct furnace; type 321 stainless steel. Re-circulated or fresh air enters through bottom, sides, or back. Built in air bypass, vent in front. Sizes from 70,000 to 245,000 Btu input.

MODEL SEU — Suspended unit heater. Recirculates room air. Diffuser outlet with adjustable vertical and horizontal vanes. Double inlet forward curve blower. Continuous duty variable pitch drives, raised port burners.



MODEL SEC

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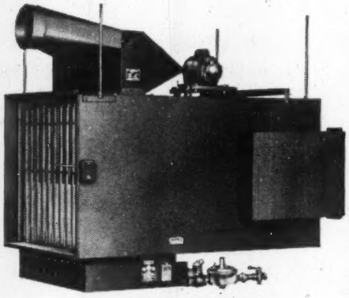

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MODEL SEC — Forced air furnace. Stainless steel heat exchanger sections seam and arc welded. One piece cast iron burners with drilled ports. Oversize double inlet blower glass or washable filters. 6 sizes — 70,000 to 245,000 Btu input.

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MODEL SES—Forced air, suspended furnace for installation in suspended duct system. Inlet and outlet designed for sheet metal duct connection. Double inlet forward curved blower. Continuous duty variable pitch drives, raised port burners.

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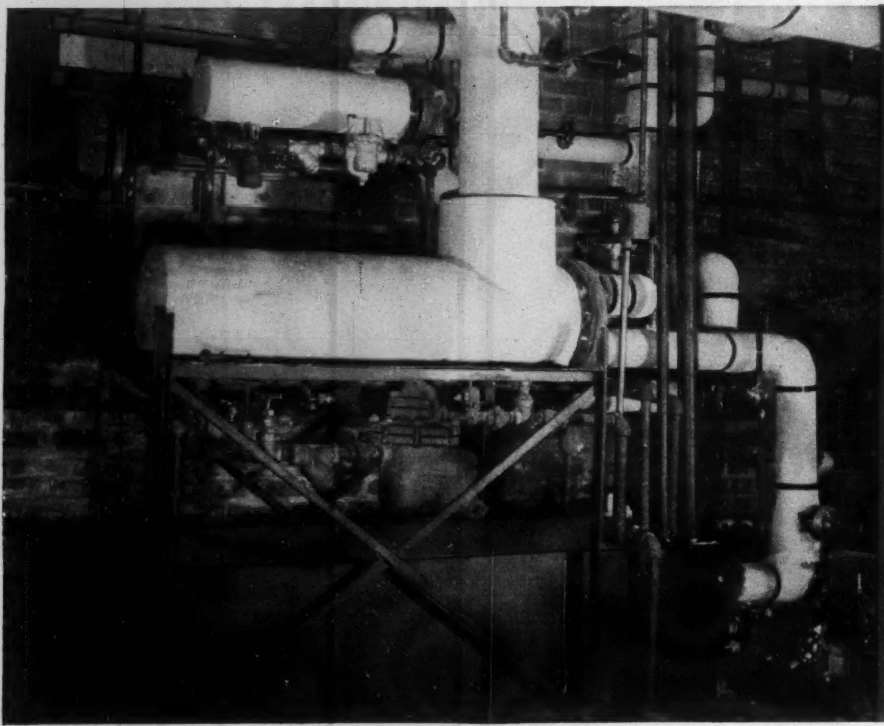

All hot water used by kitchens and guests at the Hotel Narragansett, Providence, R. I., is provided by this GENERAL Instantaneous Water Heater (center). Heater is only 4 ft. 7 in. long: 16 in. in diameter . . . replaces huge storage tank. Installed by Allen & Reed Co., Providence, R. I.

. . . one GENERAL Instantaneous Heater now supplies 250 rooms – 3 large kitchens!

In recent extensive modernization activities at the Narragansett Hotel, the hot water supply wasn't overlooked. This progressive New England hotel replaced a bulky 5000 gal. storage tank with a compact modern GENERAL Instantaneous Heater. Now, this single tankless source supplies water at 180° for the kitchens and, through the use of a GENERAL Thermostatic Mixing Valve, water at 140° for guest use! What's more, the new system saves on steam consumption, wastes less heat "down the drain", and requires only a fraction of the space formerly needed. And there's always plenty of continuous hot water . . . even at peak draws.

For a diagram of this efficient GENERAL System, which includes a condensate economizer and a circulating water heater, write to GENERAL Fittings Company, Dept. A, 123 Georgia Ave., Providence 5, R. I.

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FIBERGLAS* LOW PRESSURE PIPE INSULATION

for low pressure steam lines, hot and cold water lines!

The day has come—no more rotting, shrinking, absorbent, *costly* insulation on your low pressure steam lines, your hot and cold water lines!

New Fiberglas Low Pressure Pipe Insulation is here—the first major improvement in low pressure pipe insulation in over 30 years—tested and proved in three years of trial applications!

Made of inert fibers of glass, this pipe dream come true will not rot, shrink, swell, buckle, sag, or contribute to corrosion. It's lightweight, resilient, moisture resistant, *and up to 50% more efficient thermally than old insulations used in low pressure service.* Best of all . . .

New Fiberglas Low Pressure Pipe Insulation is priced right in line with ordinary insulations!

Which means that for any given installation it's actually cheaper. For thanks to higher efficiency, Fiberglas Low Pressure Pipe Insulation does the same insulating job as thicker, old-type insulation on hot piping—and it lasts and lasts. The properly located vapor barrier (on the outside of pipe insulation) helps avoid condensation, adsorption and resultant corrosion of pipe and deterioration of insulation.

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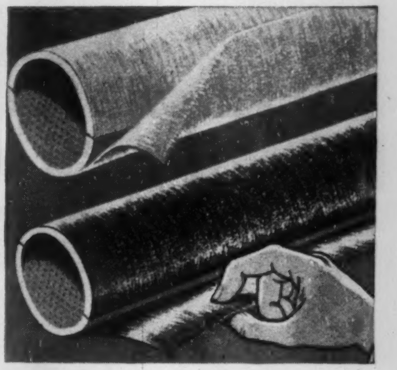
Whatever the application—low pressure steam, hot or cold water—Fiberglas Low Pressure Pipe Insulation pays for itself time and time again. Moreover, it's easy to cut and handle, fast and economical to install. Jackets designed for hot and cold service are factory applied at no additional cost.

Full information is now available in a new 4-page technical bulletin. To get your free copy immediately, mail the coupon now!



New Fiberglas Low Pressure Pipe Insulation comes in pre-formed, easy-to-apply sections for standard pipe up to 12", all copper tubing up to 3" in diameter. Finishes, including vapor barrier for anti-sweat cold water applications, are *factory applied.*

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Hard job made easy!

Just a few turns of that little wrench and the Taper-Lock bushing loosens—the sheave slips off the shaft without a struggle. No hammer, no crowbar, no shock to bearings or machinery! Taper-Lock is easiest, quickest to mount—easiest, quickest to remove—yet it holds to the shaft with the firmness of a shrunk-on fit. The Taper-Lock bushing seats evenly along the entire length of the hub.

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THERE'S ONLY ONE TAPER-LOCK, THE BUSHING THAT MOUNTS FLUSH!

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MAGNETIC CIRCULATOR
DYNAPUMP
MODEL
SERIAL
VOLTS
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PATENTS PENDING
FOSTORIA PRESSED STEEL

THIS IS THE REVOLUTIONARY, NEW *Dynapump*

The difference is 10 exclusive features

1. Motor and pump totally enclosed in one sealed unit.
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3. Completely leakproof—no fluid loss.
4. Suitable for high pressures or high vacuums.
5. Corrosion resistant stainless steel construction.
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7. No couplings or alignment problems.
8. No contamination of fluids pumped.
9. Extremely compact and light-weight.
10. Easily mounted in any position, any angle.

All these exclusive features at no extra cost—and at a price lower than most ordinary centrifugal pumps!

The new DYNAPUMP eliminates 90% of the difficulties encountered with conventional pumps! A rotating magnetic field drives the impeller . . . eliminates drive shaft, shaft seal, stuffing box . . . causes of most pump failures. This unique magnetic drive has been proven on thousands of critical applications. Fractional horsepower units now available. For low first cost, minimum maintenance cost, easy installation, plus superior pumping performance, specify DYNAPUMP!

Full information is given in Bulletin No. P-11-53 . . . send for your copy.

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MAGNETIC fostoria PUMPS

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Blazing the trail to better air distribution

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Our first step was to establish laboratory facilities in which every possible condition of air distribution could be simulated. After a comprehensive analytical and testing program, the variables which had to be considered were compiled into the form of usable application engineering data. This tabular information is now time-proved and has been used for years by engineers, architects, and contractors as the basis for determining, in the job layout stage, the exact requirements for any desired conditions. This trail-blazing approach on the part of Barber-Colman engineers marked the beginning of *engineered* air distribution in the heating, ventilating, and air conditioning field.

Pioneering pays

The laboratory facilities enabled our engineering staff to apply its talents to a number of problems confronting the industry, with the result that many new developments were introduced. Among these were volume control and air flow balancing devices (notably opposed-blade dampers and Volocitrols); air turning devices (Airturns and Deflectrols); ceiling outlets (round, square, and Line-O-Flo straight-line diffusers), and many more. More recently, our staff has pioneered in the solution to the problems encountered in high velocity systems. The laboratory lends itself to the solution of unusual air distribution problems, and many engineers and architects have availed themselves of our facilities and background of experience.

Continued progress

Only business growth makes continued research and development possible. Volume has to keep pace with rising development costs, and a generous share of profit must be reinvested in the interest of progress. That is our policy.

False economy

Many factors contribute to a successful air conditioning system, but only the air being distributed comes in contact with the people the system serves—to them the air distribution *is* the air conditioning. Stripped of false economy, the air distribution can be the *performance bond* for the system—yet even the highest quality air handling equipment represents but a small part of the total investment.

Guaranteed performance

Barber-Colman certified selection data is your guarantee that results will match the design. Specify Barber-Colman *and be sure!*

BARBER COLMAN

UNI-FLO ENGINEERED

Air Distribution

BARBER-COLMAN COMPANY

Dept. G, 1101 Rock St., ROCKFORD, ILLINOIS, U.S.A.

Air Distribution Products • Automatic Controls • Industrial Instruments • Aircraft Controls • Small Motors • Overdoors and Operators Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

Assembly Line Steam Trap Maintenance Saves Time and Money

It costs less to repair a group of traps before they all need it than to wait and repair one at a time

CHART I — COST OF LABOR FOR ONE TRAP

(assuming labor at $2.00 per hr.)

LABOR	MINUTES	COST
Get parts from store room	3	
Get tools	2	
From store room to trap	5	
Shut off steam	1	
Wait for trap to cool	5	
Remove cap and mechanism	2	
Replace Valve, Seat and Lever Assembly	4.5	
Remove old gasket and clean gasket surface	2	
Apply gasket dope	1	
Put on new gasket	1	
Install cap with mechanism	2	
Turn on steam	1	
Back to shop	5	
TOTAL PER TRAP	34.5 min.	$1.15
TOTAL COST OF LABOR FOR 8 TRAPS SERVICED INDIVIDUALLY	4 hr. 36 min.	$9.20

CHART II — COST OF LABOR FOR 8 TRAPS SERVICED AT ONE TIME

(assuming labor at $2.00 per hr.)

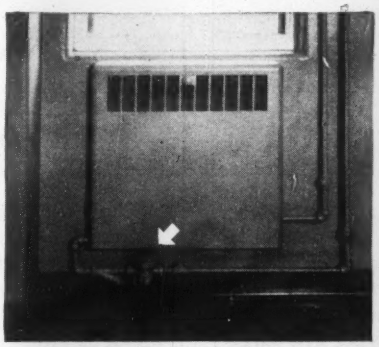
LABOR	MINUTES	COST
Get parts from storeroom	3	
Get tools	2	
From storeroom to trap	5	
Shut off steam	1	
Wait for traps to cool	5	
Remove caps and mechanisms	16	
Replace Valves, Seats and Lever Assemblies	36	
Remove old gaskets and clean gasket surfaces	16	
Apply gasket dope	8	
Put on new gaskets	8	
Install caps and mechanisms	16	
Turn on steam	1	
Back to shop	5	
TOTAL	2 hr. 6 min.	$4.20

ARMSTRONG traps do not demand constant attention, but when they do need repairs, maintenance money can be saved by replacing parts not only in the trap requiring immediate attention, but also, in the remaining traps of that series.

For example, assume eight traps were installed on an eight-coil dryer at the time of its installation. When one of these traps becomes worn to the point of needing replacement parts, there is a direct savings if *all* the traps receive new internal mechanisms at the same time.

Several traps draining the same machine, receive approximately the same wear. When one trap becomes worn to the extent of needing new internal parts the others will be soon to follow.

If the remaining traps have an average of 10% service life, before requiring repair, and the cost of a new valve, seat and lever assembly were approximately $4.00, replacement before absolutely necessary would involve a loss of $0.40 per trap. However, the labor cost involved will more than make up for this loss.



Armstrong No. 800 draining a convector at Globe Steel Tubes Company. Parts for this trap cost only 2¼ cents per year. Average trap life is 11 years.

Chart I shows that the cost of labor involved to service one trap is $1.15. Therefore, repair labor for eight traps serviced individually would cost approximately $9.20.

Chart II shows the cost of labor involved to service all eight traps at the same time. Here we find the labor cost is only $4.20. This leaves a labor profit of $5.00.

The loss of $0.40 per trap times the remaining seven traps is $2.80. Subtracting $2.80 from $5.00 leaves a profit of $2.20 gained by servicing all eight traps at the same time.

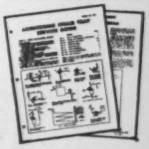
Thus, if traps are put on regular maintenance schedule and assembly-line servicing is employed, a very definite profit can be shown, plus the assurance of maximum operating economy at all times. Traps are kept in tip-top shape, eliminating steam or fuel waste that might occur if the trap is not caught before it goes bad.

Your local Armstrong Representative has parts in stock and valuable trap service knowledge to help you. Call him, or write:

ARMSTRONG MACHINE WORKS
874 Maple Street • Three Rivers, Michigan

FREE MAINTENANCE BULLETINS—

Bulletin No. 239 is an 8-page trap Service Guide; Bulletin No. 292 tells how to save money on trap repairs. Send for them — no obligation.



ARMSTRONG STEAM TRAPS

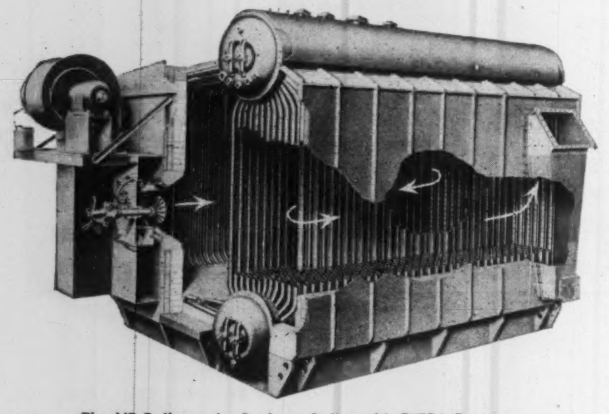
FOR STEAM CAPACITY up to 60,000 POUNDS

Choose your boiler from these two

If you burn oil or gas, investigate the VP Package Boiler for capacities up to 30,000 pounds per hr . . . the VU-10 up to 60,000 pounds.

For stoker firing, the VU-10 is available from 10,000 to 60,000 pounds of steam per hour.

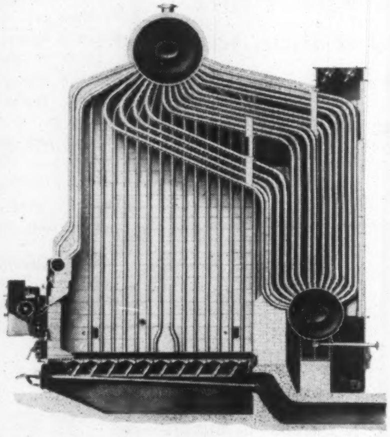
Whatever your fuel . . . whatever your steam capacity requirements up to 60,000 pounds per hour . . . you'll find that one of the Combustion Engineering Boilers described below will be just right for you.



The VP Boiler — the Package Boiler with EXTRA Features

The VP *boiler*

The C-E Package Boiler, type VP . . . completely shop-assembled . . . for oil or gas firing. It is available in capacities from 4,000 to 30,000 lb steam per hr; for pressures to 500 psi. The VP Boiler has more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. The large (30-in. diameter) lower drum permits a simple, symmetrical tube arrangement . . . greater water storage capacity . . . easy access for washing down or inspection. The centrifugal fan is efficient, yet its noise level is less than half that of typical high-speed blowers used on most package boilers. Baffle arrangement is simple, resulting in low draft loss . . . simple soot blowing . . . elimination of dead pockets . . . high heat absorption.



The VU-10 Boiler, as arranged for C-E Spreader Stoker firing

The VU-10 *boiler*

The VU-10 Boiler is designed for industrial load conditions, particularly for plants with small operating and maintenance forces. Capacities range from 10,000 to 60,000 lb steam per hr . . . pressures to 475 psi . . . heat recovery equipment is available if desired. Fuel can be either coal (C-E Spreader, Traveling Grate or Underfeed Stoker) oil or gas. This boiler is a completely standardized design adaptable to many conditions. It responds readily to variations in load; it is simple to operate and maintain. All parts are easily accessible for inspection. Like the VP, the VU-10 Boiler is a complete unit — boiler, furnace setting, fuel-burning equipment, controls, forced draft — bringing you the benefit of one contract . . . one responsibility.

Fully descriptive catalogs are available on both of these boilers. We'll be happy to send yours upon request.

C-E

COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y. B-763B

BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

AIRMAT PL-24

THE *Multi-Million* AIR FILTER

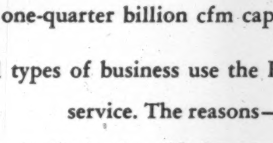
SINCE its introduction in 1936, over 225,000 units of this AAF dry filter, totaling one-quarter billion cfm capacity, have been installed.

All types of business use the PL-24 for all types of air cleaning service. The reasons—the highest cleaning efficiency of any commercial unit filter; simplified maintenance eliminating oil or water for washing.

The Type PL-24 is sturdy and compact—provides 28 sq. ft. of effective filtering area in a unit 2′ x 2′ x 8″. The efficient Airmat paper filtering media, being low in cost, is quickly replaced when soiled—cutting maintenance cost and returning filter to initial resistance and original condition. Unit construction simplifies installation for any capacity requirements.

Yes, in design, performance and acceptance, the Airmat PL-24 is definitely a multi-million*air* filter. For complete product information, call your nearest AAF representative or write for Bulletin No. 230.

AAF



American Air Filter
COMPANY, INC.

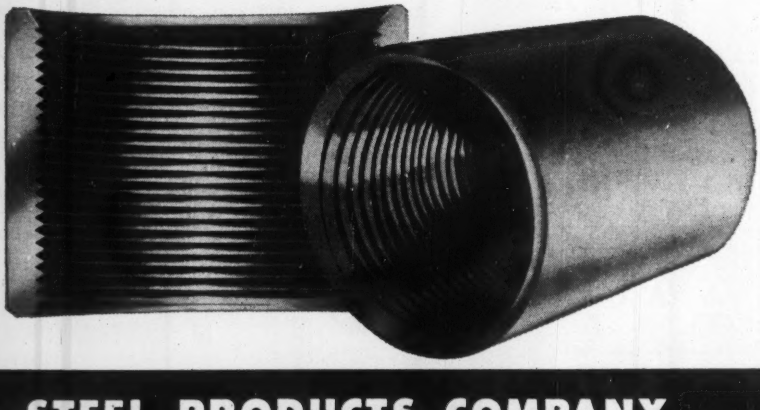
373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

ASK YOUR JOBBER FOR . . .

WHEATLAND PRECISION COUPLINGS

DEEP CUT-TESTED THREADS THAT GO ON SPEEDILY-INSURE PERFECT GRIP

- **Clean outside finish**
- **Continuous even depth thread**
- **Deep round chamfer**
- **Heavy galvanized coating**
- **Pressure tested**



WHEATLAND STEEL PRODUCTS COMPANY
BANKERS SECURITIES BLDG., PHILADELPHIA 7, PA.

USE THIS Bayley CHECK LIST...

To Compare
the Quality
and Performance
Features of Any
CENTRIFUGAL
FAN!

1 Finished Inlets and Outlets Ready for Duct Connections.

2 Well-formed Inlet Cones — Streamlined Air Flow.

3 Welded or Bolted Housings — No Open Seams.

4 Statically and Dynamically Balanced Wheels Designed for Maximum Duty.

5 Full-Weight Housings — Prevent "Breathing".

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7 Shafts and Bearings Specially Selected for Ample Safety Factor — Best Adapted for Long-Lasting, Quiet Performance.

only BAYLEY gives you ALL SEVEN!

Bayley BLOWER COMPANY

Engineered Air-Handling Equipment

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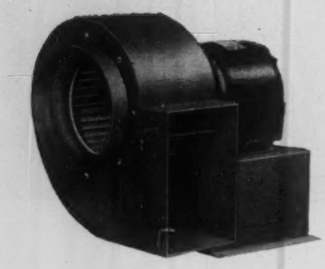
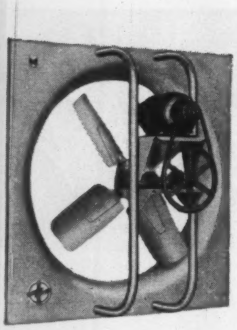
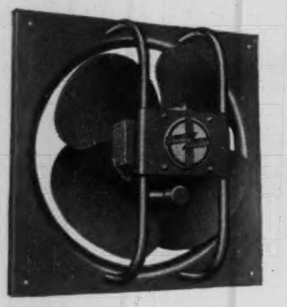


Direct connected utility blower

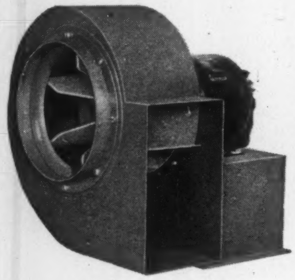


Industrial exhaust fan

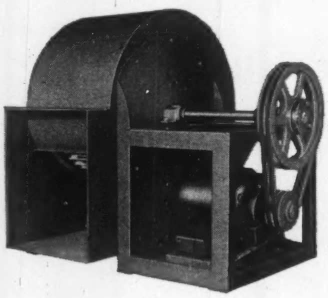
Ventilattic fan



Commercial exhaust fan



Kitchen exhaust blower



Belt drive utility blower

it's price and delivery that count in Fan and Blower Sales

COMPETITIVE PRICES . . .

There's one sure way to increase your fan and blower sales—sell Peerless, the line that gives you competitive prices, immediate delivery and free engineering help on tough jobs.

Every Peerless fan and blower is completely manufactured under one roof. That's why Peerless can set and hold its prices to meet competition, and that's also why Peerless can cover each of the products in its line with an iron-clad guarantee.

IMMEDIATE DELIVERY . . .

Because Peerless has full control of its manufacturing, you get delivery when you want it. Right now, for instance, you can get immediate delivery on any item in the big Peerless line.

Finally, when a tough job that requires extra engineering comes up, you can bid it in with the knowledge that Peerless will give you any help required at no cost to you. You can often get the information you need with one phone call. When the job is truly complicated, Peerless flies an engineer to your office to work with you.

If you want help where it counts most — competitive prices and quick delivery — write for them today You'll be glad that you did.

FAN AND BLOWER DIVISION
THE PEERLESS ELECTRIC COMPANY
1409 WEST MARKET ST. WARREN, OHIO

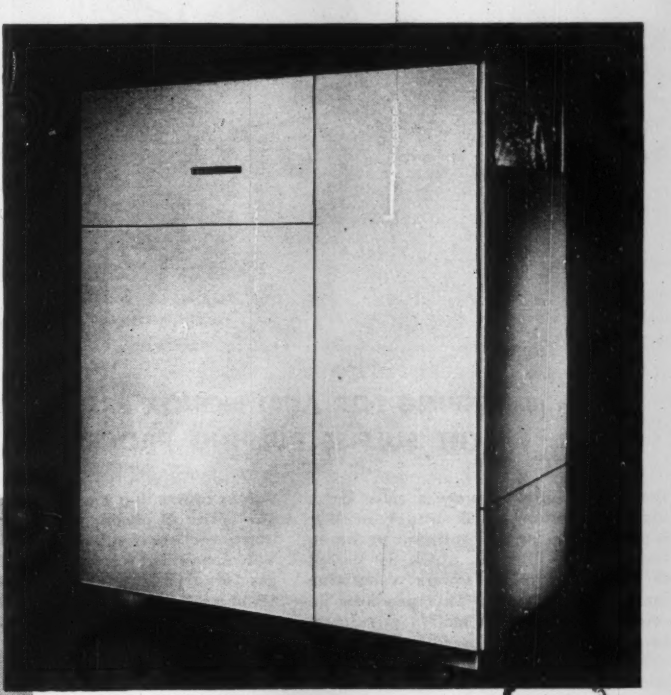
Peerless Electric

ALL-ELECTRIC, YEAR 'ROUND

air conditioning

...7 FEATURES THAT PEOPLE WILL BUY

Get Them ALL in the Westinghouse Heat Pump



1. Heating and cooling from a single, all-electric unit
2. Waterless operation
3. Flameless—uses no fuel but air and electricity
4. No chimneys, flues or fuel storage required
5. Installs anywhere—in the garage, in the utility room or basement
6. Fully automatic
7. Economical operation the year 'round

SELL THESE FEATURES WITH WESTINGHOUSE PROMOTION

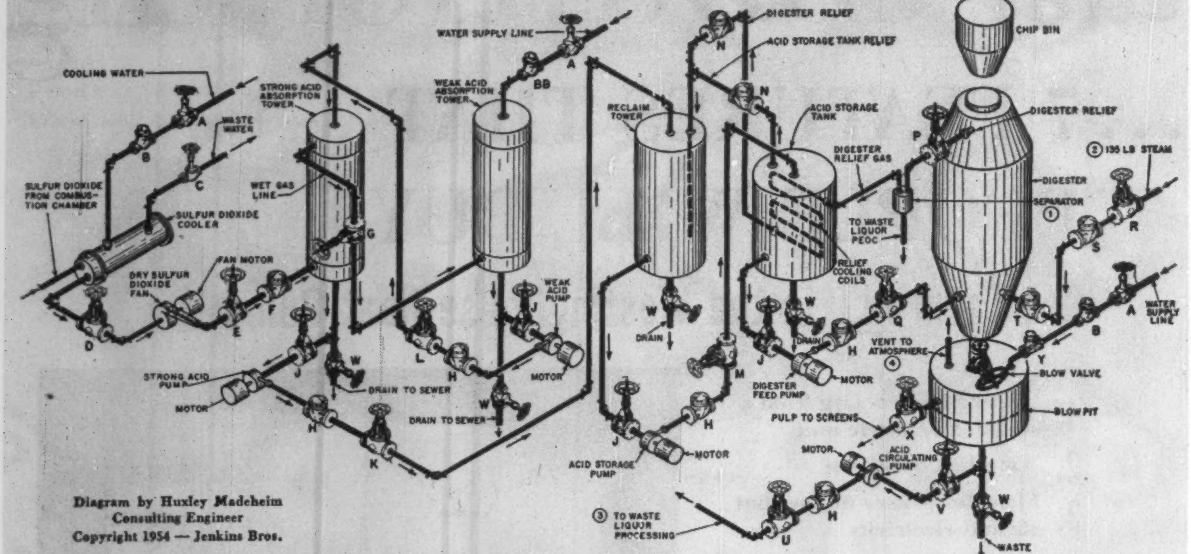
Westinghouse franchised dealers capitalize on the complete Westinghouse promotion package—direct mail, ad mats, sales literature, specification sheets, radio and TV spot announcements—plus the tremendous consumer acceptance of the Westinghouse name. Write Air Conditioning Division, Westinghouse Electric Corporation, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR CONDITIONING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80390

JENKINS PRACTICAL PIPING LAYOUTS 73


COOLING WATER
A
WASTE WATER
B
C
SULFUR DIOXIDE FROM COMBUS-TION CHAMBER
SULFUR DIOXIDE COOLER
DRY SULFUR DIOXIDE FAN
FAN MOTOR
D
E
F
STRONG ACID ABSORPTION TOWER
WET GAS LINE
G
STRONG ACID PUMP
MOTOR
J
H
W
DRAIN TO SEWER
K
WATER SUPPLY LINE
A
BB
WEAK ACID ABSORPTION TOWER
L
H
J
WEAK ACID PUMP
MOTOR
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DRAIN TO SEWER
RECLAIM TOWER
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ACID STORAGE PUMP
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③ TO WASTE LIQUOR PROCESSING
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J
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BLOW VALVE
BLOW PIT
PULP TO SCREENS
X
MOTOR
ACID CIRCULATING PUMP
V
W
WASTE

Diagram by Huxley Madeheim
Consulting Engineer
Copyright 1954 — Jenkins Bros.

VALVE RECOMMENDATIONS
For details of Jenkins Stainless Steel Valves, write for Bulletin 200.

Code	Quan.	JENKINS VALVE	SERVICE
A	3	Fig. 106-A, Bronze Globe	Water supply control
B	2	Fig. 352, Bronze Swing Check	Water line secondary check
BB	1	Fig. 1328, Stainless Steel Swing Check	Water line check
C	1	Fig. 47-U, Bronze Gate	Cooler water shutoff
D	1	Fig. 613, I.B.B.M. Globe	Sulfur dioxide fan control
E	1	Fig. 651-A, I.B.B.M. Gate	Gas shutoff
F	1	Fig. 1331, Stainless Steel Swing Check	Prevent strong acid backflow to SO_2 fan
G	1	Fig. 1307-A, Stainless Steel Gate	Gas shutoff
H	5	Fig. 1331, Stainless Steel Swing Check	Prevent backflow to pump
J	4	Fig. 1307-A, Stainless Steel Gate	Pump suction shutoff
K	1	Fig. 1317, Stainless Steel Globe	Strong acid pump discharge control
L	1	Fig. 1317, Stainless Steel Globe	Weak acid pump discharge control
M	1	Fig. 1317, Stainless Steel Globe	Acid storage pump discharge control
N	2	Fig. 1331, Stainless Steel Swing Check	Prevent gas backflow
P	1	Fig. 1307-A, Stainless Steel Gate	Digester relief control
Q	1	Fig. 1317, Stainless Steel Globe	Digester feed pump discharge control
R	1	Fig. 1040, Cast Steel Globe	Steam control valve
S	1	Fig. 1025, Cast Steel Swing Check	Steam line secondury check
T	1	Fig. 1331, Stainless Steel Swing Check	Prevent acid backflow
U	1	Fig. 1317, Stainless Steel Globe	Acid circulation pump discharge control
V	1	Fig. 1307-A, Stainless Steel Gate	Circulating pump shutoff
W	5	Fig. 1308, Stainless Steel Globe	Drain control
X	1	Fig. 1317, Stainless Steel Globe	Pulp discharge control
Y	1	Fig. 1328, Stainless Steel Swing Check	Prevent acid backflow

How to plan PIPING FOR ACID LIQUOR PREPARATION IN THE SULFITE PULPING PROCESS

The sulfite pulping process calls for a digester solution that is strongly acid. It is prepared by burning sulfur or pyrites to form sulfur dioxide, which is passed through absorption towers containing limestone and water. This produces an acid liquor consisting mainly of calcium bisulfite and sulfurous acid. The wood chips are cooked with this acid liquor at approximately 300°F, by steam admitted as indicated in the diagram.

Pressure is reduced by opening the digester relief valve when cooking is completed. The hot gases pass through the coils in the acid storage tank to preheat the liquor, then back to the reclaim tower where they go into solution. Next, the liquor and pulp are forced into the blow pit by the pressure remaining in the digester. The liquor is drained off and sent to waste, or is processed for by-products. Water, free of impurities which might contaminate the pulp, is then admitted to wash the pulp thoroughly. After this washing, the pulp passes onto screens and eventually to the paper making process.

Valves controlling the dry sulfur dioxide gas (prior to passing through an absorption tower) are iron body bronze mounted. Valves specified for the wet sulfur dioxide gas (after passing through an absorption tower) are stainless steel, because of the corrosive nature of the acid bearing gas. Valves in the liquor lines are Stainless Steel, Type 316, due to the corrosive combination of calcium bisulfite and sulfurous acid. Valves for water and steam lines are bronze, with the exception of the check valves marked "S" and "Y", which are stainless steel due to the possibility of acid liquor or gas backing up.

Consultation with accredited piping engineers and contractors is recommended when planning any piping installation.

To simplify planning, select all the valves you need from the complete Jenkins line. It's your best assurance of *lowest cost in the long run.* Jenkins Bros., 100 Park Ave., New York 17.

Complete description and enlarged diagram of this layout free on request. Includes additional detailed information.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864
TRADE JENKINS MARK

Jenkins Bros

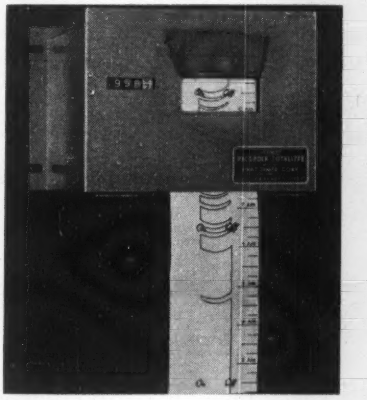
SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS EVERYWHERE

EQUIPMENT DEVELOPMENTS...

For reviews of Recent Trade Literature see page 228.

Timer for Supervising Heating

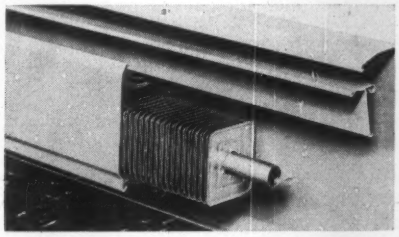
"Recorder-Totalizer" and "Totalizer" designed to check and supervise the efficiency of heating systems. . . .On a continuous tape, a permanent record shows chronologically when the heat is on or off. The "Recorder-Totalizer" shows in bold relief defects in the heating plant, compares fuels, and indicates that the plant was in operation during authorized periods. In addition to the tape recording, the total operating time is automatically recorded in a manner similar to the mileage meter of an automobile.



Manufacturer—Heat-Timer Corp., 657 Broadway, New York 12.

Packaged Baseboard Radiation

New line of packaged baseboard radiation which is factory assembled and requires no special tools for installation . . . Special features include snap-on covers and a vane type deflector which serves as a damper for individual control of each room. The deflector also is designed to direct the flow of heated air at ankle height. Elements are available with copper tubes and aluminum fins or steel tubes and steel fins. Sections may be ordered in 4, 6 and 8 ft lengths.



Manufacturer—Fedders-Quigan Corp., Heating Div., Hancock and Lalor Sts., Trenton, N. J.

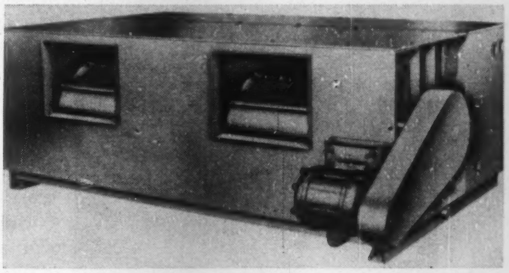
Plastic Pipe

The manufacturer is in the process of installing equipment for the production of plastic pipe, scheduled to begin in September. Screw-type extruders are being installed to manufacture pipe from $\frac{1}{2}$ in. to 6 in. Several plastic materials will be used, including polyethylene and polyvinyl chloride. Developmental work is being done on improved thermoplastic materials and on reinforced thermosetting types of plastic.

Manufacturer—National Tube Div., United States Steel Corp., 525 William Penn Pl., Pittsburgh 30.

Factory-Built Air Conditioners

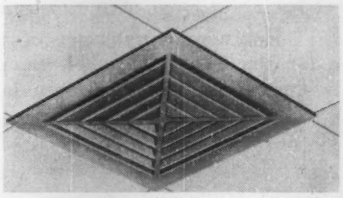
New line of "Climate Changers," factory-built air conditioning units with capacities ranging from 600 to 29,000 cfm. . . . It includes both horizontal and vertical models each in 10 sizes for floor or ceiling mounting. The new units feature sectional construction enabling all but the largest in size to pass through a 36 in. door and the largest through a 40 in. door. Another feature is a sloping drain pan under the entire unit to give positive drainage of condensate. Fan outlets are reversible in the field. There is a choice of different heating and cooling coils and humidifiers. Each unit has a mixing box with filter frames.



Manufacturer — The Trane Co., LaCrosse, Wis.

Ceiling Diffuser

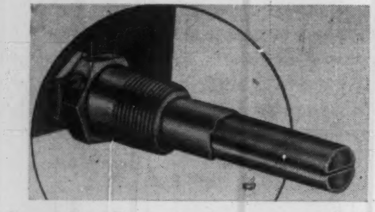
New "Model 101" ceiling diffuser featuring a square, modern design. . . .The manufacturer states that it has a large amount of free face area and a low air resistance factor. It is being produced in 6, 8, 10, 12 and 14 in. sizes and can be supplied with or without a damper.



Manufacturer—Midco Register Corp., 1059 Grand Ave., St. Paul, Minn.

Hot Water Controls

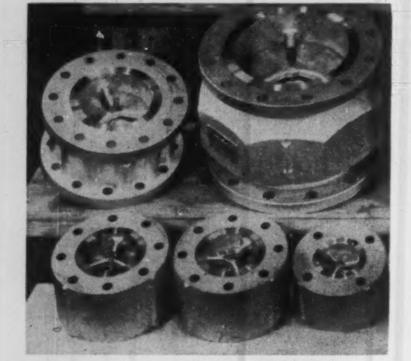
Hot water limit controls featuring a "universal" contact structure to handle voltages from millivolts to 230 volts in gas or oil installations. . . .Two bulbs of half-round design are contained in a single well so that they fit snugly against each other and against the sides of the well. Because there is no dead air space, these controls give rapid response to changes in water temperature, the manufacturer says.



Manufacturer—White-Rodgers Electric Co., 1209 Cass Ave., St. Louis 6.

Center Guided Check Valve

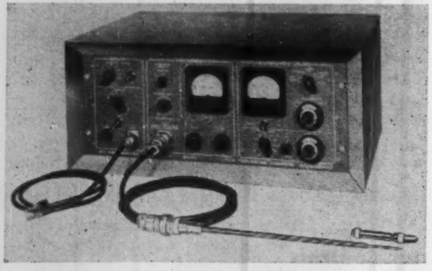
Center guided check valves designed to be shockproof and silent in operation. . . .The valves consist of four parts—body, seat ring, conical spring and a central guided disc. Convex seat and disc and a wide opening provide for low pressure loss and full flow. The manufacturer states that the octagonal design of the valve gives greater internal area with less weight. Sizes range from 10 through 20 in.



Manufacturer—Miller Valve Co., Inc., P.O. Box 1255, Pittsburgh 30, Pa.

Anemometer for Fluid Flow Measurement

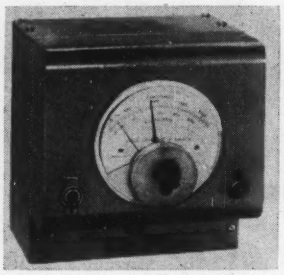
Hot wire anemometer of the constant current type for the measurement of average velocity, large velocity fluctuations and turbulence in fluid flow. An oscilloscope is the only accessory required for the "Model HWB." According to the manufacturer, the compensated amplifier responds from 2 to 100,000 cps and has an equivalent input noise level of ½ microvolt. A calibrating signal is provided for direct evaluation of velocity fluctuation magnitudes and for setting the amplifier compensation.

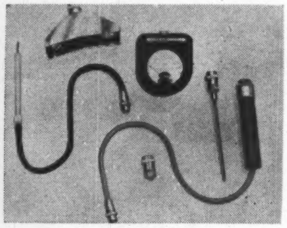


Manufacturer—Flow Corp., 283 Concord Ave., Cambridge 38, Mass.

Pocket Pyrometer, Temperature Controller

One of two new products being offered is a pocket pyrometer, "Model 240-T," which has a 2.4 in. direct reading indicator scale. . . . The manufacturer states that it gives accurate measurement of surface and sub-surface temperatures through the use of interchangeable thermocouples. It is housed in a shock absorbing rubber case and is available in six standard ranges starting at 400 F.





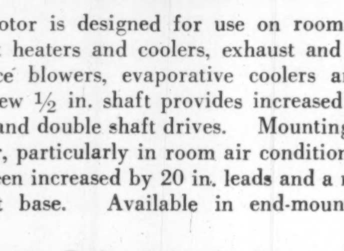
Above: Pyrometer
Left: Controller

The second product is "Cyber-Tac, Model 505," electronic instrument to control high temperature furnaces and other heating applications. Using a thermocouple type pyrometer in the input circuit and a power relay in the output circuit, the manufacturer states that it may be used for controlling temperatures and for indicating and limiting temperatures.

Manufacturer — Cybertronic Corp. of America, Dept. HD, Industrial Center, Third and Morton Aves., Chester, Pa.

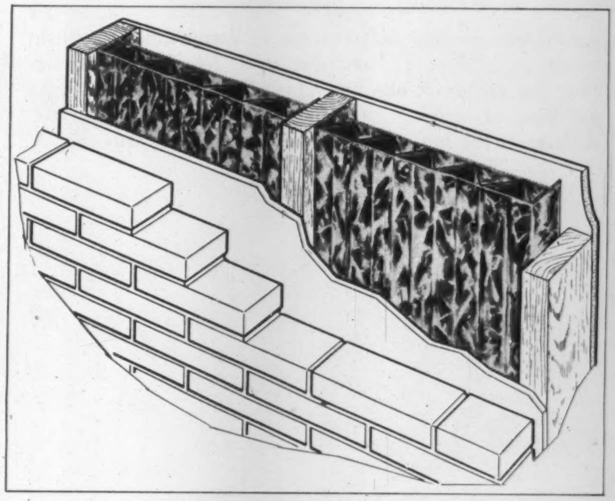
Fractional Horsepower Motor

Greater mounting versatility and increased shaft rigidity are new features of an improved shaded-pole fractional horsepower motor. . . . The "KSP" 21-frame motor is designed for use on room air conditioners, unit heaters and coolers, exhaust and circulating fans, furnace blowers, evaporative coolers and window fans. A new ½ in. shaft provides increased rigidity to long single and double shaft drives. Mounting versatility of the motor, particularly in room air conditioner applications, has been increased by 20 in. leads and a new 3½ in. shaft height base. Available in end-mounted or re-



Metals are the Best Insulators

Against Heat, Cold, and Vapor in Building Spaces



The surfaces of ordinary IRON have about 4 times the reflectivity against heat rays that the surfaces of asbestos, asphalt paper, brick, rockwool, plaster, wood and other ordinary building materials have. Brass, gold, silver and ALUMINUM surfaces have about TEN TIMES the reflectivity against heat rays that these non-metallic materials have. Aluminum surfaces, for example, have a 97% reflectivity for RADIATION whereas the surfaces of most building materials, including ordinary insulations, have a reflectivity of only 10%.

RADIATION (heat rays) is responsible for 65% to 80% of all heat flow sideways in building spaces; 55% to 75% upwards; and 93% downwards.

Air space has low density, therefore heat flow by CONDUCTION through the **spaces** inside building walls, roofs, attics or floors is slight. CONVECTION can account for 15% to 30% heat flow sideways in such spaces, and up to 45% upwards. There is NO convection downwards.

AN EXCELLENT "INSULATING BLANKET"

Multiple sheets of metal, spaced apart, make an excellent barrier to heat and vapor flow in any direction. In Multiple Accordion Aluminum, as it is installed in one simple operation, tough metallic sheets are automatically expanded and spaced by fiber separators. It becomes a full-depth, **edge-to-edge** "insulating blanket" with alternating layers of aluminum, fiber and low density reflective air spaces. Both the fibrous and metallic sheets retard convection.

Such an insulating blanket is widely known and specified as Infra Multiple Aluminum Insulation. More than 210 million square feet are in use today.

Infra's continuous metal sheets, up to 750 feet long, have zero permeability to water vapor. Infiltration under flat stapled flanges is slight. Condensation formation on or within this type of insulation is minimized by the scientific construction of multiple layers of accordion aluminum, fiber, and air spaces.

FREE! RADIATION TABLE AND ASHVE BOOKLET

Check coupon to get useful Table of the heat ray reflectivity of a long list of materials.

The American Society of Heating and Ventilating Engineers has published an interesting booklet: "Insulating Effect of Successive Air Spaces. Bounded by Bright Metallic Surfaces." Ask for a FREE copy by checking coupon.

COST OF INFRA INSULATION INSTALLED
in new construction between wood joists,
material with labor,
Type 6-S under 9½¢ sq ft.
Type 4-S under 7½¢ sq ft.

INFRA INSULATION INC.
525 Broadway, N.Y.C., Dept. H-7
☐ Please send FREE ASHVE booklet. (Ins. Effect, etc.)
☐ Heat ray reflectivity table.
Name____________________
Firm____________________
Address__________________

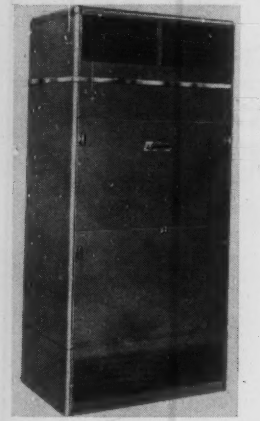
INFRA INSULATION, INC., 525 Bway., New York, N. Y. WOrth 4-2241

silient-base, open and totally enclosed fan cooled models, the motor is manufactured in 1550 rpm, 4 pole, 60 cycle ratings of 15 milli-horsepower to 1/10 hp, and in 1050 rpm, 6 pole, 60 cycle ratings of 25 mhp to 1/10 hp.

Manufacturer — General Electric Co., 1 River Rd., Schenectady 5, N. Y.

Self Contained Air Conditioner

Free standing, self contained summer air conditioner cooling unit for use in commercial establishments. . . . "Type F," available in 2, 3 and 5 ton capacities, has an air intake and glass fiber filter assembly at the base of the unit. Adjustable louvers in the outlet diffuser at the top of the unit direct air both horizontally and vertically into selected spots. The cabinet stands 88½ in. high, 26 in. deep and varies in width from 26½ to 40½ in., depending on the size of the cooling unit. Heavy fiber glass material is used for acoustical purposes, as a heat insulator and to help prevent moisture condensation on the cabinet.



Manufacturer — Janitrol Div., Surface Combustion Corp., 400 Dublin Ave., Columbus 16, Ohio.

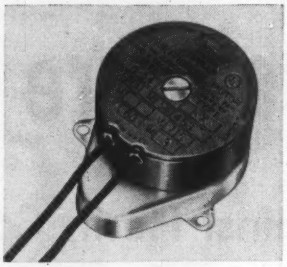
Dehumidifier Control

Automatic control for electric dehumidifiers. . . . Named the "Humidistat," it is engineered to stop and start a dehumidifier motor automatically. Its humidity detection element attached to a small switch in the instrument senses any undesirable change in the moisture content of the air, the manufacturer states. Installation requires no extra wiring. It comes equipped with a cord attached to a dual purpose socket which may be plugged into the nearest wall outlet. The dehumidifier plugs into the socket of the "Humidistat." It is designed to control dehumidifier motors up to 1/6 hp.

Manufacturer — Friez Instrument Div., Bendix Aviation Corp., Taylor Ave., Towson, Baltimore 4.

Synchronous Motor

Synchronous motor, "Type KX", designed to deliver 30 in. ounces of torque at 1 rpm . . . . It will run equally well in any position due to a balanced bearing system and universal capillary lubrication, the manufacturer states. The motor is available in a range of speeds from 60 rpm to 1 rpm, for either right, left or oscillating rotation. Patented "no-back" gears control direction of rotation. Provisions for permitting the shaft to be turned independently of the motor or gearing can be supplied.



Manufacturer — R. W. Cramer Co., Inc., Centerbrook, Conn.

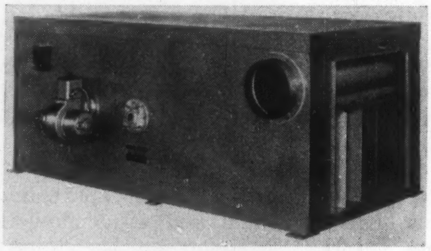
Plastic Film for Piping, Other Uses

Oil resistant, non-migratory film for the tape industry. . . . The vinyl film is used for coil and cable insulation, corrosion protection for equipment, and protection of underground piping. Designated as "Ultron R 118," the company states that the film may be coated with a variety of pressure sensitive adhesives, or it may be used uncoated as a winding or wrapping tape.

Manufacturer — Monsanto Chemical Co., 800 N. 12th Blvd., St. Louis 1.

Oil Fired Duct Heater

Oil fired duct heater for use with central air conditioning systems in industrial applications. . . . The duct heater is equipped with specially designed air intake louvers to balance the distribution of air over the heat exchanger and to give correct air velocity. It is available in 200,000, 300,000 and 400,000 Btu output sizes at the bonnet. Units can be furnished with burners either on the right or left side and installed in any convenient location or suspended from ceiling joists.



Manufacturer — OverHead Heaters, Inc., 1612 Book Bldg., Detroit 26.

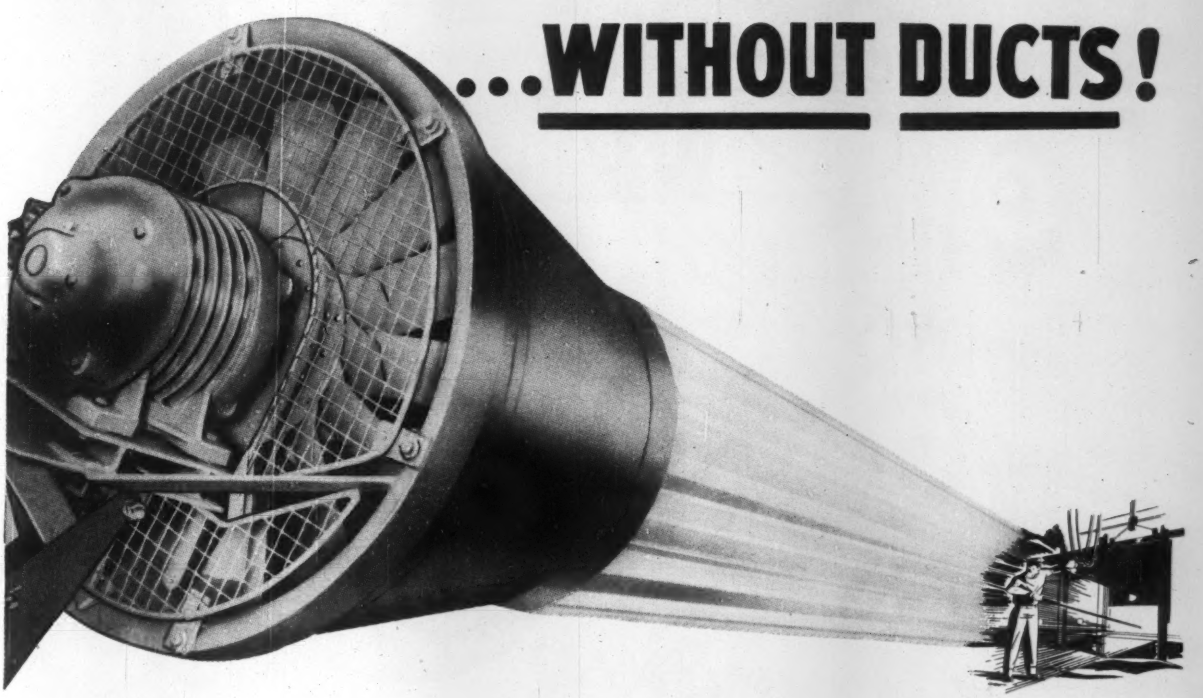
Roof Valve for Fire Fighting

Roof unit for industrial buildings which opens when excess interior heat occurs. . . . Called a "Fire Valve," it acts to release heat, gases and smoke in the event of fire. Each unit of the valve is designed to provide 46 sq ft of free area opening when two large dampers drop, released by a fusible link device. Dampers can also be opened and closed by a loop chain when desirable

[*Continued on page* 213]

SHOOT COOLING AIR 60 FEET

...WITHOUT DUCTS!



"HY-V" AIR JETS project a stream of cooling air to plant hot spots at velocities up to 5780 FPM. The "Hy-V" is a 14-blade axial flow pressure fan built into a nozzle-shaped housing. This fan eliminates expensive ductwork and it's flexible too — it can be aimed up, down or from side to side. And since "Hy-V" hurls the air stream as far as 60 feet, it can be mounted in an out-of-the-way location.

COOLS WORKERS The "Hy-V" Air Jet spot-cools men exposed to heat from ovens, furnaces, forges or molten metal. Workmen become less fatigued and require less time out.

COOLS EQUIPMENT "Hy-V" Air Jet directs a concentrated stream of air onto machinery and equipment that must be cooled in a hurry. Quick cooling with "Hy-V" can often speed up production and cut manufacturing costs.

COOLS PRODUCT A high-velocity stream of air can be pin-pointed on a product in process for faster cooling or drying.

These fan units are furnished with wall-mounting brackets or on wheeled stands. Fan wheel diameters range from 18″ to 30″. Further details are covered in Bulletin DH-8-54. Send for your free copy today.

MAIL COUPON TODAY

DeBothezat Fans

Division of
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS DIVISION
American Machine and Metals, Inc.
Dept. HP-754, East Moline, Illinois
Send free Bulletin DH-8-54 containing complete data on "Hy-V" Air Jets.

FIRM NAME

ADDRESS

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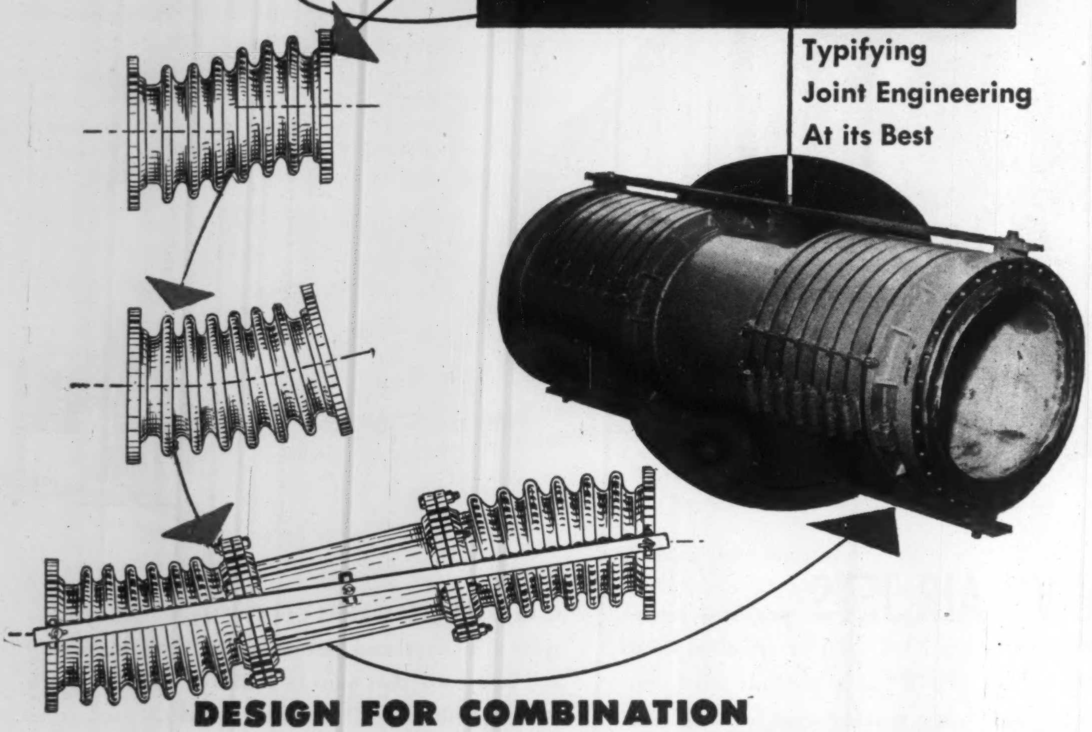
NAME AND TITLE

Badger

EXPANSION JOINTS

Typifying
Joint Engineering
At its Best



DESIGN FOR COMBINATION LINEAR-SHEAR-LATERAL MOVEMENTS

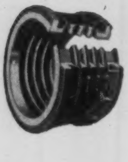
Study these sketches showing (somewhat exaggerated, of course) several of the more complex movements to which expansion joints are often subjected. Do you have such pipe line conditions? Do you have any installation coming up that might involve such movements?

Here's the Badger Joint that is designed for just such a problem: the TANDEM JOINT. It's available in both Self-Equalizing and Non-Equalizing design. The joint movement is controlled by the tandem bars pivoting on a pin in the connecting nipple. Permissible shear or lateral movement depends upon the overall length as well as the number of corrugations in each unit. Each tandem unit is designed to suit the individual job requirements.

The Tandem Joint is but one of several special types designed for complex pipe line movements. We'll be glad to study your problem and make recommendations. Should yours be a straight linear traverse—as most installations are—we have a wide range in Directed Flexing, Self-Equalizing and Non-Equalizing Joints made of copper or stainless steel, with flanged or welding ends.

Badger Expansion Joints come in a variety of types and a wide range of sizes: Directed Flexing, Self-Equalizing for longer traverses and higher pressure; Non-Equalizing, for shorter traverse or when pressures are low. Tandem Joints for combination axial and lateral movements; Clevis Joints for angular rotation.

Special Vibration Control Joints; Flexible Pipe Line Seals for watertight connection between pipe and flood walls.



BADGER MANUFACTURING COMPANY

Original and Sole Manufacturer of Badger Expansion Joints

230 BENT STREET • CAMBRIDGE 41, MASS.

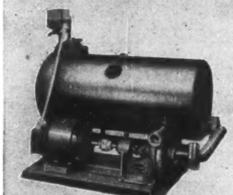
Get the most from your pump investment

There's a wide range of types and capacities for every heating pump need. Let Skidmore advise you on your next tough ob.

TYPE UV

Type UV Condensation Pump is designed for below floor level returns, and is built in single and duplex units.

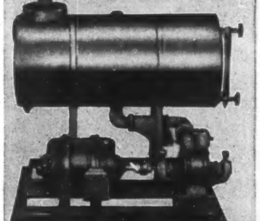
Write for ***Bulletin No. 19-A***



TYPE HS

Type HS Pump is recognized for its dependable low operating cost. Capacities range from 1,000 to 65,000 sq. ft. EDR and pressures from 10 to 75 pounds.

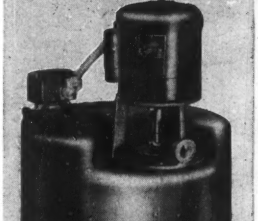
Write for ***Bulletin No. 14-A***



TYPE TM

Type TM High Pressure Turbine Pump. Designed for pressures up to 150 pounds and boilers to 250 H.P.

Write for ***Bulletin No. 17***



TYPE CV

Type CV Vertical Pump is ideal where space is limited. This model like every Skidmore Pump is built to meet specific requirements. For the correct solution to your own pump problem consult a Skidmore Heating Pump Specialist.

Write for ***Bulletin No. 21***

Alert-minded . . . engineers and contractors who are value and maintenance-wise are "all eyes" on Skidmore Pumps. Men *who know* are quick to spot the many advantages that only dependable Skidmore Pumps can offer — whatever your heating pump installation requirement — look at Skidmore *first!*

TYPE "UV" — Available in duplex and single units — recommended for below floor level returns. Unit is bolted to sump type receiver. Capacities ranging from 2,000 to 40,000 sq. ft. E.D.R. and discharge pressures from 10 to 75 pounds.

Skidmore Pumps have set a Standard of performance and dependability since 1921

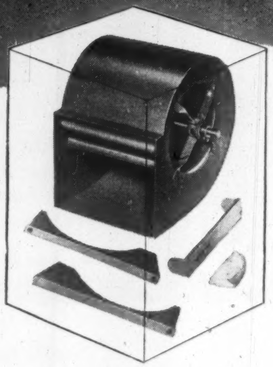
SKIDMORE
PUMPS

SKIDMORE CORPORATION
ST. JOSEPH, MICHIGAN

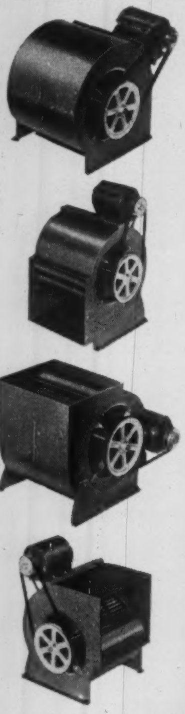
This Wraps It Up in One Neat Package!

Brundage

UNIVERSAL BLOWERS



Meets up to 80% of your applications



Each Universal Blower provides 8 discharge positions!

MEASURE THE DIRECT ADVANTAGES IN YOUR PLANT

SAVE MONEY. Order the blower size you need in larger quantities. Your ordering procedure is simplified and your actual cost per unit is lower.

SAVE TIME. Not only in ordering, but all through your manufacturing operations, you'll find that handling and installation is faster . . . saving time that is actually dollars in your pocket.

CUT YOUR INVENTORIES. You'll free capital that's normally tied up in inventory and stock will require less space. Brundage Universal Blowers pay big dividends at every step of the way.

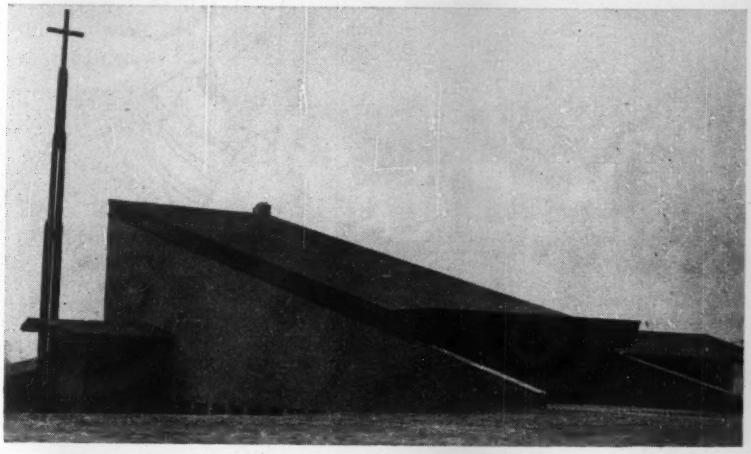
YOUR SAMPLE BLOWER is just a phone call away. Ask for the sizes you want and prove Brundage superiority to your own satisfaction in your own laboratory.

THE BRUNDAGE COMPANY
North Park St. Kalamazoo, Michigan
Telephone 2-0251

WARM AIR HEATED...

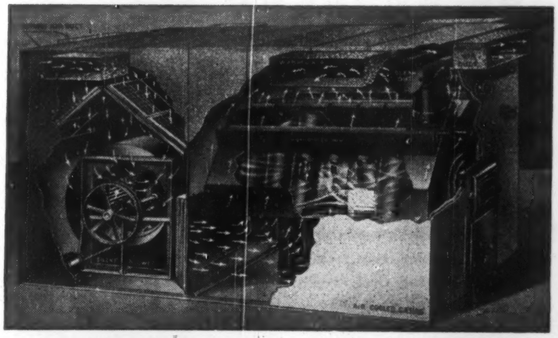
by Campbell

Mount Olive Lutheran Church, Des Moines, Iowa. A Campbell No. 8075 gas-fired heater was specified for this outstanding church structure, completed in 1953. Brooks-Borg, architects, Des Moines. Iowa Sheet Metal Co., contractors.



FOR CHURCH HEATING

Campbell 8000 Warm Air Heaters are noted for the many advantages they offer for church heating. They provide quick, positive temperature control to meet the varying "on and off" requirements of churches, schools, theaters and other public buildings. They assure positive control of humidity and ventilation, and are easily adaptable for summer air conditioning. Compact, easily installed. On your next church heating job, build your plans around a Campbell 8000 warm air heater.



MANUFACTURERS' AGENTS

We have a number of attractive openings for manufacturers' agents who call on heating contractors and architects. If interested, please state territory you cover.

CAMPBELL HEATING CO.
Des Moines 17, Iowa

I am interested in your proposition for manufacturers' agents.

My territory covers..................................

NAME..................................

ADDRESS..................................

CITY........................ZONE......STATE......

CAMPBELL HEATING COMPANY

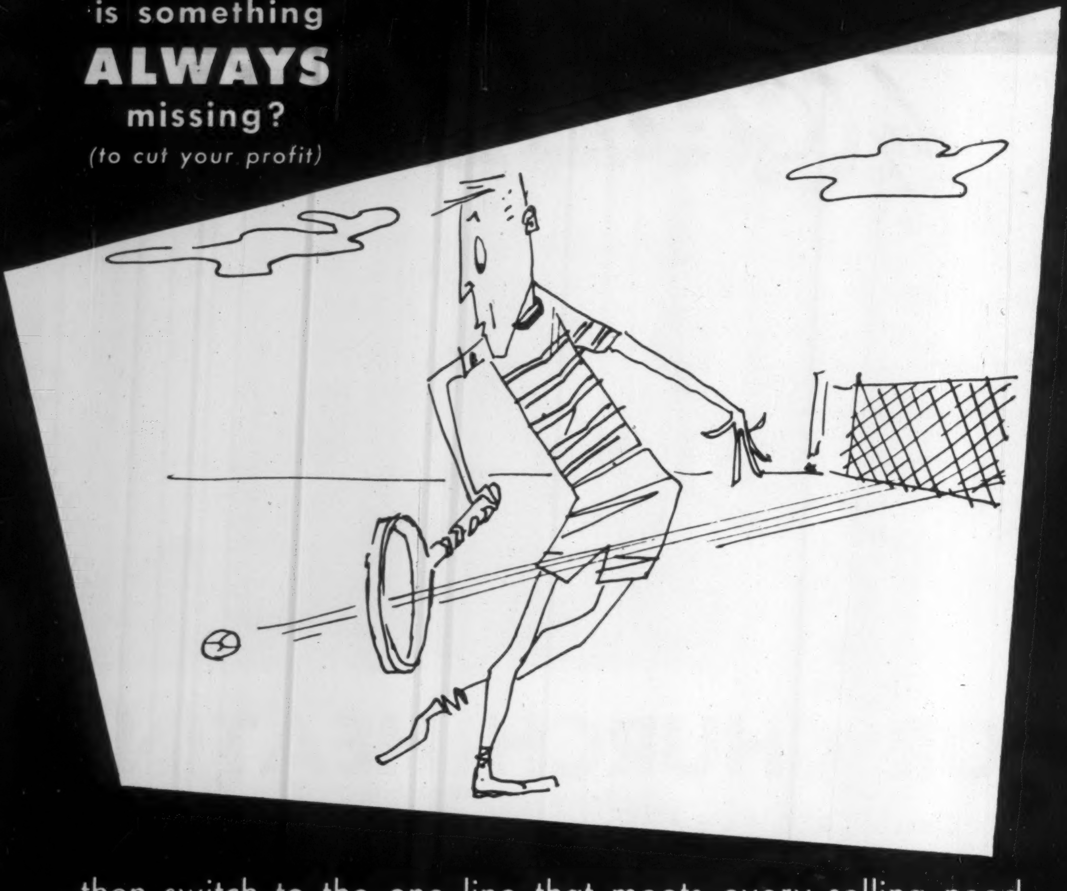
Des Moines 17, Iowa

is something

ALWAYS

missing?

(to cut your profit)



...then switch to the one line that meets every selling need

* **EXAMPLE No. 5:** Local distributor warehousing and service are other advantages you enjoy when you handle the Bryant line. Your Bryant Distributor is equipped to help you on sales calls . . . to offer technical assistance . . . to co-operate in local promotion . . . to promptly supply the equipment or parts you may need for any job. He is as near as your telephone. And his services are backed by competent factory district representatives, factory product specialists and traveling factory sales-training and service teams.

It will pay you to call your nearby Bryant Distributor today.

bryant®

HEATING AIR CONDITIONING WATER HEATING

1. The most complete line in the industry
2. Quality products—Competitively priced
3. Established name—Good customer acceptance
4. Broad, attractive profit margins
5. * Local Distributor warehousing and service
6. Factory district representatives and traveling sales training and service teams

Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, Ohio

EQUIPMENT DEVELOPMENTS

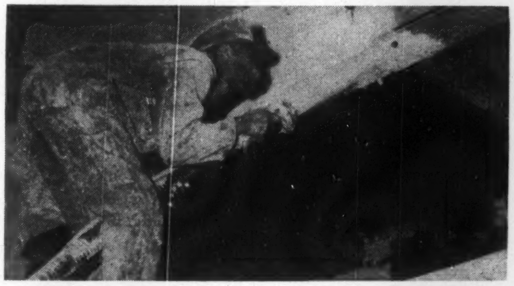
Continued from page 206

to use the unit for extra ventilation in good weather. The unit is weatherproof when closed.

Manufacturer — The Swartwout Co., 18511 Euclid Ave., Cleveland 12.

Sprayed Fiber Insulation

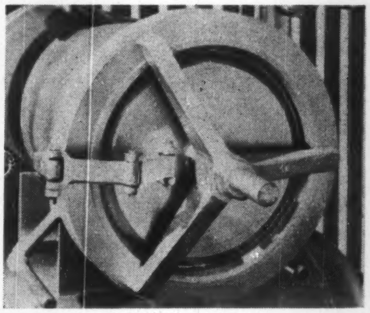
New company will market a gun-sprayed fiber insulation for finishing building interiors. . . . Known as "Cafco Spray," it is made of a blend of mineral wool fibers. The manufacturer states that is has good insulating, fireproofing and sound-absorbing qualities. It may be applied to metal, transite, plaster, wood, concrete, gypsum or wire lath. Its original color is white but it may be painted any color.



Manufacturer — Columbia Acoustics & Fireproofing Co., subsidiary of United States Mineral Wool Co., Stanhope, N. J.

Closure for Pressure Vessels, Piping Systems

"Flex Ring" pressure closure for pressure vessels and piping systems incorporating internal pressure closing and metal to metal seal principle. . . . It is designed to seal tighter as the pressure upon it increases. The closure consists of a weld neck, plug, gasket and spider. A special feature is the flexible metal gasket which is held in compression between the plug and weld neck. The gasket is flexed to an elliptical shape to allow it to pass through the plug opening. Once in place, tightening the spider nut causes the gasket to return to a round shape for proper seating position.



Manufacturer — Sillers Engineering Co., Box 7193, Dallas, Texas.

Kits for Casement Conditioners

Casement window kit to adapt standard window room air conditioners to casement windows. . . .

ALADDIN UTILITY SETS

COMPACT
TEN SIZES
BELT DRIVEN
SELF CONTAINED
QUIET OPERATING

CERTIFIED RATINGS
Certified ratings are the result of tests made by the Manufacturer in accordance with the Standard Test Code for Centrifugal, Axial, and Propeller Fans adopted jointly by the National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers.
AUTHORIZED BY NAFM
© THE NATIONAL ASSOCIATION OF FAN MFGRS., INC.

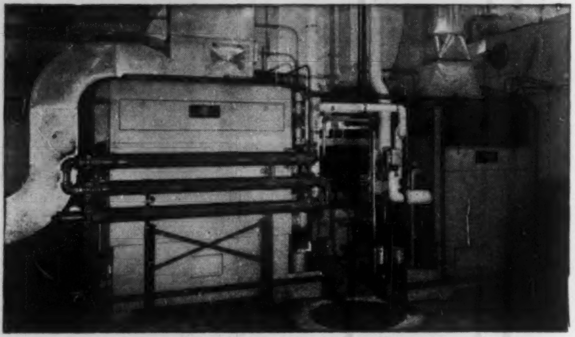
ALADDIN Belt-Driven Utility Sets are extremely quiet in operation. Designed for general ventilation, they occupy a minimum of space, handling large volumes of air at low noise levels. They are ruggedly built and are ideally suited for roof installation . . . when furnished with weatherproof cover they require no further protection against the weather.

ALADDIN Utility Sets are available with both forward curved or backwardly inclined blade wheels.

Write for complete data

ALADDIN HEATING CORPORATION
1111 WEST AVENUE 137 • SAN LEANDRO, CALIF.
REPRESENTATIVES IN ALL PRINCIPAL CITIES IN THE WEST

This NEW METHOD DRIES AIR
PRECISELY AS YOU WANT IT



NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

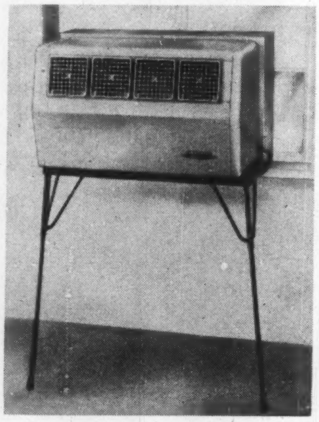
Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

For complete information write

NIAGARA BLOWER COMPANY
Over 35 Years of Service in Industrial Air Engineering
Dept. HP. 405 Lexington Ave. New York 17, N. Y.
Sales Engineers in Principal Cities of U. S. and Canada

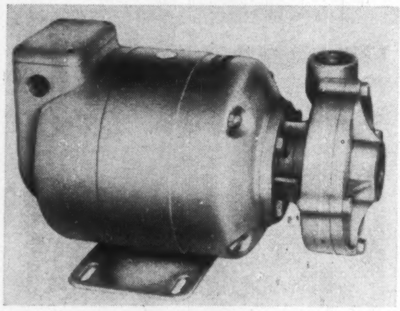
The kit consists of a base and legs, a steel cabinet, aluminum drip pan, adjustment dowels and fastening hardware. The air conditioner does not project outside the casement window so that it is not necessary to cut the steel mullions or deface the casement steel. The manufacturer states that the removal and cutting of glass and in some cases, the removal of sash cranks or locking devices is all that is necessary.



Manufacturer — Quiet Kool Mfg. Co., 46 Oliver St., Newark 5, N. J.

Centrifugal Pump for Air Conditioning

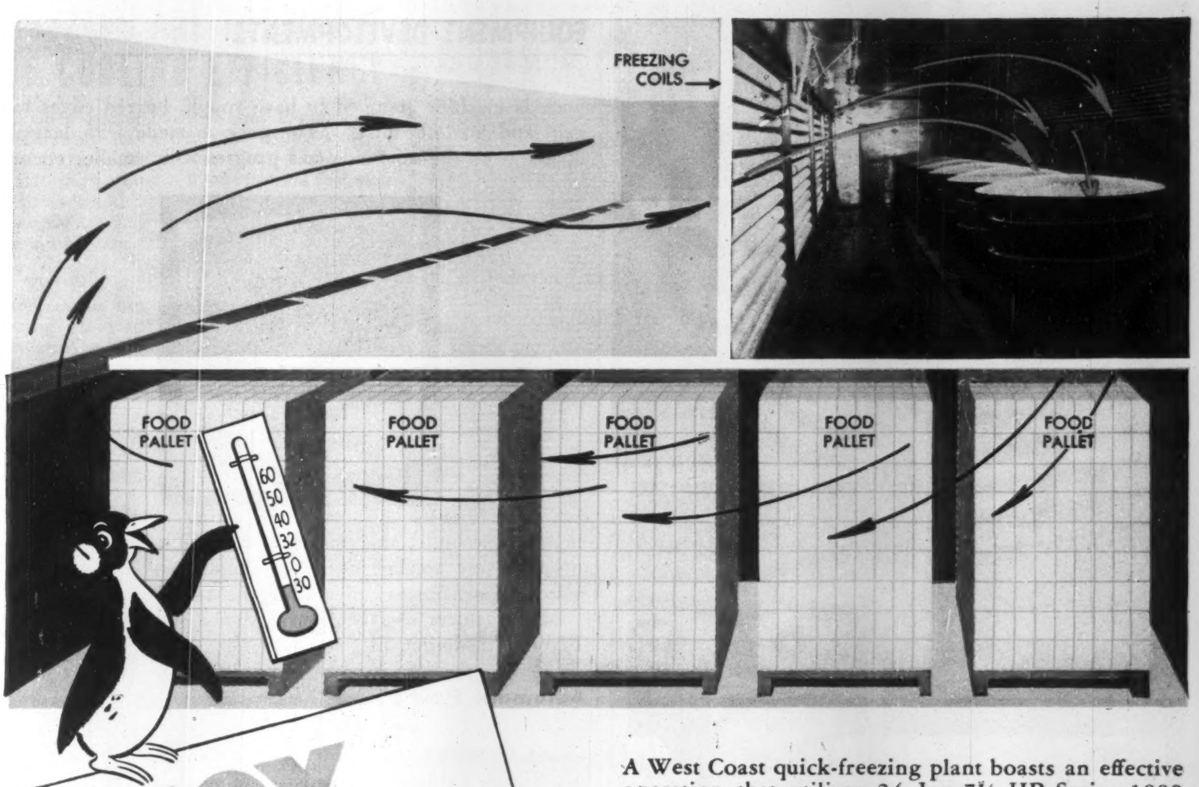
New direct connected compact motor driven "Rumaco" centrifugal pump, "Model D-501". . . . It is designed for various air conditioning installations, including evaporative condensers and medium size cooling towers requiring up to 40 gpm at a 30 ft head. The unit is bronze fitted and will handle water and other liquids without danger of rust or corrosion, the company states. It is equipped with a self adjusting seal, is furnished with either a 1/4, 1/2 or 3/4 hp motor, and may be installed vertically or horizontally.



Manufacturer — The Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 2.

Aluminum Air Filter

Aluminum air filter for heating and cooling systems. . . . The company says that precision angled openings set up a high turbulence within the filter and cause the air to travel over 3.5 times the width of the filter from the inlet to the outlet side. The filter



JOY ® AXIVANE FANS HANDLE SEVERE QUICK-FREEZE JOB

A West Coast quick-freezing plant boasts an effective operation that utilizes 24 Joy 7½ HP Series 1000 Axivane Fans, installed in two groups of 12 each.

Note the illustration above. The upper floor contains freezing coils and a row of 12 fans. The floor below is partitioned into narrow freezing tunnels, each served independently by a single Joy fan.

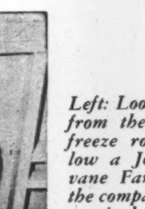
As air passes through the freezing coils, it is cooled to between —30° and —35°. This sub-zero air is propelled down and through the tunnels below, which contain pallets of meat, vegetables, fruit, etc. to be quick-frozen. After passing over the food, the air is again cooled and circulated. At full plant load, each 12-fan battery handles 242,000 CFM of air.

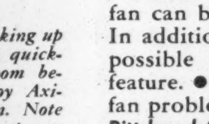
The relatively quiet operation, light weight, compactness and low power consumption of Joy Axivane Fans—due to the unmatched efficiency of their vaneaxial design—have proved *real* advantages on this job. Their in-line construction also saves space, since each fan can be mounted right in its short, vertical duct. In addition, extreme flexibility of operation is made possible by the adjustable blades, a standard Joy feature. ● Let us help you to get best results on your fan problems. **Joy Manufacturing Company, Oliver Bldg., Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Left: Looking up from the quick-freeze room below a Joy Axivane Fan. Note the compact, economical use of space and the simple mounting.

Consult a Joy Engineer

for Vaneaxial Fans . . . Compressors, Vacuum Pumps and Boosters . . . Oxygen Generators





W&D I-4466

JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

Mueller Climatrol
TYPE 160
GAS UNIT HEATER

NEW! New design, new efficiency. A.G.A.-approved for natural, manufactured, mixed, and propane gas.

MORE EFFICIENT! Designed for real heating economy — longer life, minimum maintenance.

EASY TO INSTALL! Shipped pre-wired and pre-assembled. Easy to hang.

. . . EIGHT SIZES FROM 50,000 TO 225,000 BTU INPUT IN INCREMENTS OF 25,000 BTU

Any way you look at it, this Mueller Climatrol has what it takes to help you fill the bill for unit heater applications of the unit-heater business in stores, garages, factories and other commercial establishments. Check these features:

Compact — only 29½" x 19½" x 12" (for the 50,000 Btu size.)

High Crown Sheet — no "hot spots", no joints or welds exposed to flame.

Welded-Steel, Air-Tube-Type Heat Exchanger — for maximum heat extraction, efficiency, *longer life.*

Quiet Fan — propeller type, properly pitched for even air distribution.

Cast-Iron Drilled-Port Burner provides even heat distribution over entire hearth area.

Built-In Diverter with rear flue outlet — adjustable louvers. Enclosure for burner and controls is optional.

Smooth Finish in cool Mountain Spring Green color, easy to repaint to match room decor.

These and many other features add up to ready acceptance of the Mueller Climatrol Type 160 Unit Heater by engineers, architects and builders.

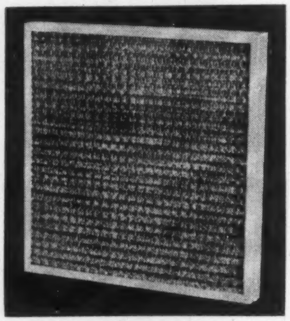
Write for facts and figures that tell you more about this newest Mueller Climatrol.

Mueller Climatrol 97th
D-152B
2023T W. Oklahoma Ave. • Milwaukee 15, Wis.

EQUIPMENT DEVELOPMENTS

Continued

pack is machine stamped to have rough, burred edges to grip and hold the dirt. The pack is made with larger openings on the inlet side and progressively smaller openings on the outlet side designed to hold the lint while the progressively smaller openings permit dirt to penetrate into the pack instead of matting on the intake face.

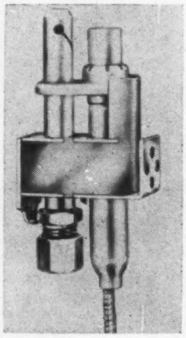


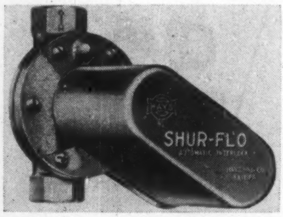
Manufacturer — The George Evans Corp., 37th St. at River Dr., Moline, Ill.

Automatic Flow Switch

"Shur-Flo Automatic Interlock" flow switch operated by means of a differential of pressure across the orifice, designed as an equipment protective device. . . . The switch is used to protect equipment requiring a definite flow of fluid to assure proper operation and prevent damage, and will cut off equipment or provide a signal whenever the flow falls below the safety rate. The ½ in. size provides switch control points from 0.1 gpm through 8 gpm; the 1¼ in. size from 8 gpm through 40 gpm.

Manufacturer — Hays Mfg. Co., Industrial Sales Div. 812 W. 12th St., Erie, Pa.





Above: Flow Switch

Left: Pilot

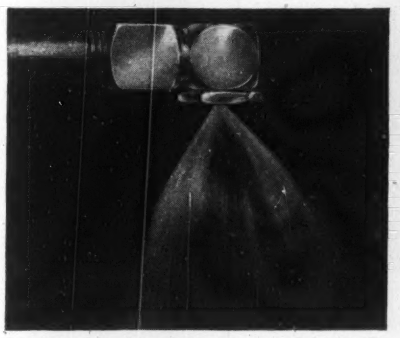
Pilot Burners and Generators

"Snorkel" pilot burners and pilot generators designed to combat the problem of lint collection and plugging. . . . They are made for above the floor heating installations which tend to collect dust and lint, and operate on the principle of drawing primary air under the pilot flame before it is mixed with gas in a cool, sealed chamber. The manufacturer says that bringing the air past the flame brings all dust and lint into contact with the flame, incinerates it and leaves the in-

NOZZLES ARE THE HEART OF COOLING EFFICIENCY

In early designs of large atmospheric cooling towers the water distributing system usually consisted of water box, flumes and distributing troughs. It was natural that engineers would look for a more efficient way to break up the water so that a greater area would be exposed to the cooling action of the air.

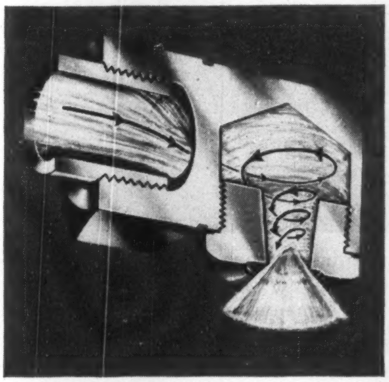
The first nozzles used for this purpose were crude, but a big step forward. After many refinements the Rotojet nozzle emerged as best suited for this work. It provided a hollow cone spray with remarkable fluid break-up.



For long life, low maintenance and high efficiency, cooling tower nozzles should be clog-proof and provide uniform spray patterns.

The Rotojets have no moving parts. They operate on the whirl chamber principle and are completely clog-proof under normal working conditions.

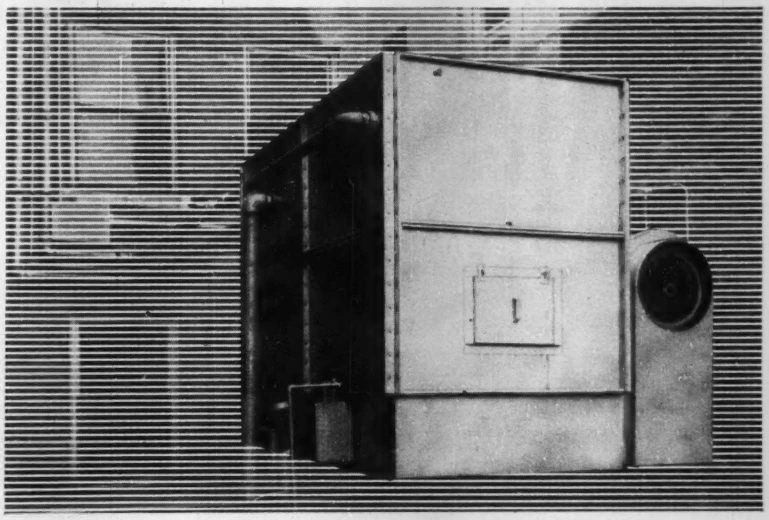
Engineers like the Rotojet for cooling tower installations because it is a precision-made nozzle. It is made in a wide range of sizes, permitting them to control the volume of water handled by a tower at a specified water pressure. This is important in the calculation of water to air ratios... the very heart of all cooling operations.



The whirl chamber principle of Rotojet nozzles gives maximum fluid break-up without the use of moving parts. This type of nozzle is clog-proof.

Full information on Rotojet nozzles and their many applications may be obtained by writing direct to the manufacturer, the Binks Manufacturing Company, 3118-38 Carroll Ave., Chicago 12, Ill.

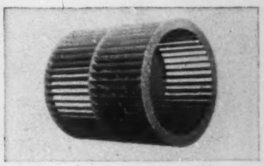
Binks series 3-B **cooling towers**



So-o Quiet...

Hotel guests sleep undisturbed

Guest rooms are only a few feet from the Binks cooling tower installed in the light court of the Malburne Hotel, Durham, N. C. But no one has complained or lost a wink of sleep. Binks cooling towers of the Series 3-B type are exceptionally quiet and are ideal for use where any noise at all would be objectionable.



Here's one reason why these towers are so quiet

Binks squirrel-cage blowers provide ample air movement while running at quiet speeds... far slower than the noisy propeller fans used in conventional towers.

You pay no more for this *extra quiet operation* and you get all these additional advantages:

- Controlled air movement through the tower makes Binks Series 3-B units independent of natural breezes.
- Air current moves in opposite direction to downward water flow. This accelerates the cooling action.
- Only dry air passes through the air propulsion assembly. Corrosion and maintenance are thus reduced.
- Non-clogging ROTOJET nozzles produce fine fluid break-up for maximum cooling.

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

REPRESENTATIVES IN ALL PRINCIPAL CITIES • SEE YOUR CLASSIFIED ☎ DIRECTORY

SEND TODAY for these bulletins:
No. 47-A—Type 2-B (3 to 30 tons)
No. 47-B—Type 3-B (1 to 108 tons)
No. 47-D—Type B-23-B (2 to 3 tons)

Binks
EVERYTHING FOR WATER COOLING

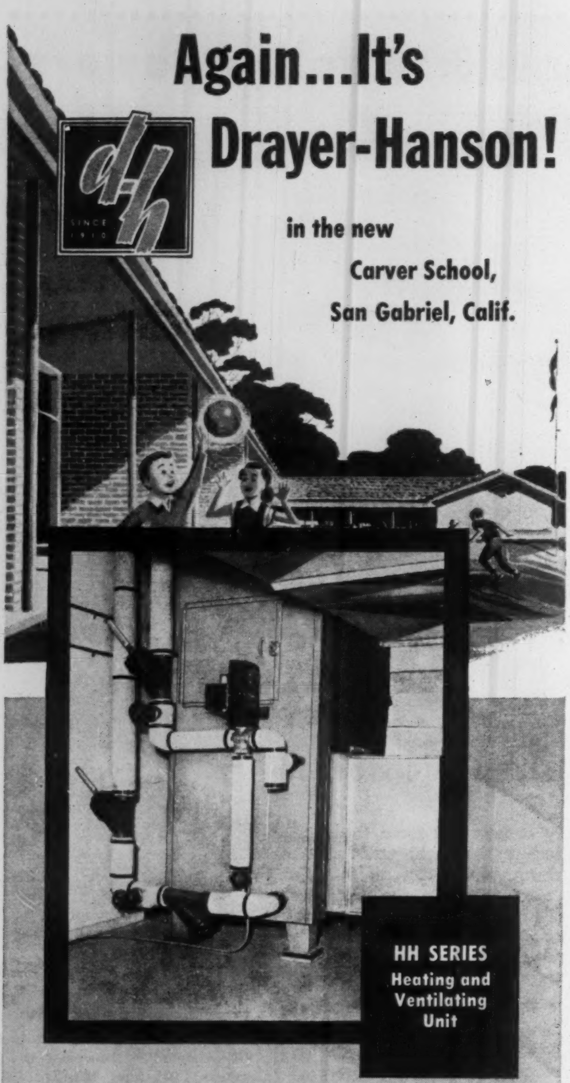
MAIL COUPON TODAY

Binks Manufacturing Company
3118-38 Carroll Ave., Chicago 12, Ill.

Gentlemen: Please rush FREE Cooling Tower Bulletins as checked:

☐ Bulletin 47-A ☐ Bulletin 47-B ☐ Bulletin 47-D

Name__________
Company__________
Address__________
City__________Zone____State________



Again...It's Drayer-Hanson!

in the new
Carver School,
San Gabriel, Calif.

In important installations everywhere ... units like this are giving the dependable, long-lived service which keynotes Drayer-Hanson products.

When your prospects say, "year-'round air conditioners," *compare*, feature by feature. You're bound to specify D-H!

With HH's, you can choose your arrangement: horizontal (HH), or vertical (HHV) units. 13 sizes, to 28,000 CFM. Coils for water, steam, direct expansion—or a combination.

You can't mistake them! *The extra features* you find in HH's are solving tough air conditioning problems, the country over.

Investigate! *Full details, request Bulletin C-4.20.*

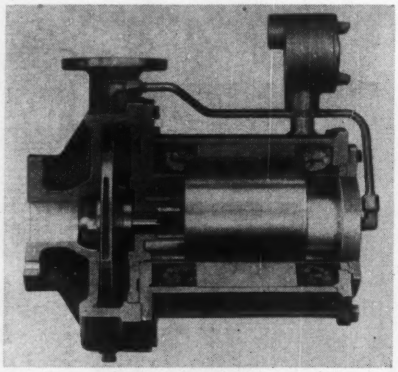
d-h SINCE 1910
drayer-hanson
INCORPORATED
3301 MEDFORD STREET, LOS ANGELES 63, CALIFORNIA

take air completely clean and free of airborne particles.

Manufacturer — General Controls Co., 801 Allen Ave., Glendale 1, Calif.

Leakproof Centrifugal Pump

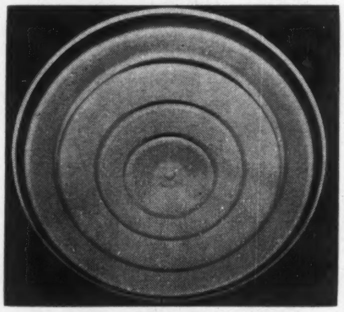
Newly designed seal-less centrifugal pump for handling chemical fluids. . . . The manufacturer states that the pump is leakproof and that a new welded construction allows field dismantling and reassembly with no loss in the leakproof qualities. "O" rings used in earlier models have been eliminated.



Manufacturer — Chempump Corp., Station R, 1300 E. Mermaid Lane, Philadelphia.

Flush Mounting Ceiling Diffuser

Flush mounted circular ceiling diffuser in neck sizes from 5 in. through 20 in., designed to handle requirements from 80 to 4500 cfm. . . . The new "Model E-1" diffuser is intended primarily for flush mounting on exposed ductwork, but can also be used on ceilings. All sizes are equipped with a sponge rubber gasket around the outer edge to form an airtight seal. Accessories include opposed blade dampers, splitter dampers, equalizing deflectors, radial deflectors and butterfly dampers.

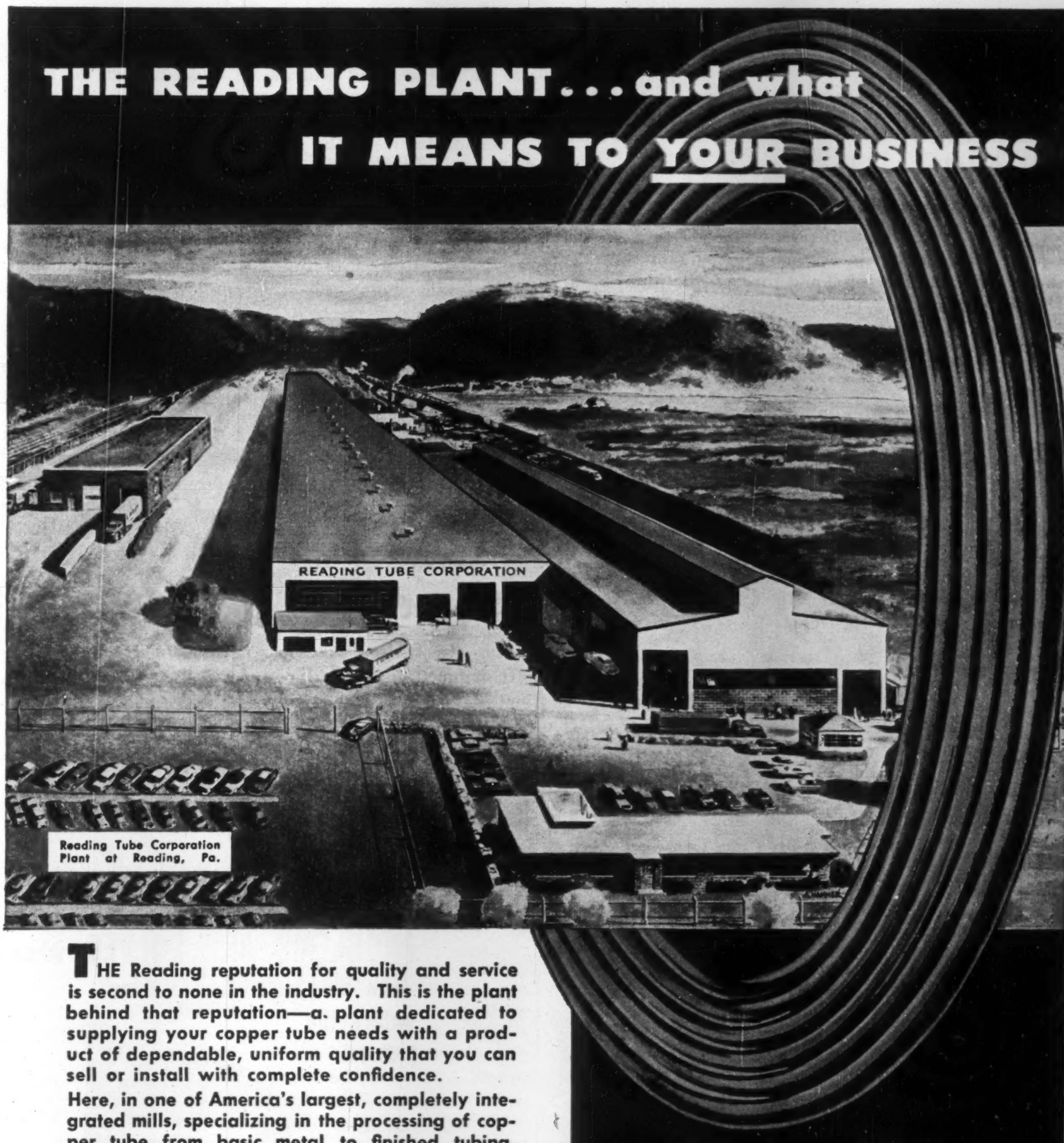


Manufacturer — W. R. Carnes Co., Verona, Wis.

Automobile Air Conditioner

Air conditioner for automobiles with the evaporator and blower assembly designed for location under the dashboard. . . . The company says that installation problems are lessened since there are no connections to be made to the trunk of the car. The unit is powered

THE READING PLANT . . . and what
IT MEANS TO YOUR BUSINESS



Reading Tube Corporation
Plant at Reading, Pa.

THE Reading reputation for quality and service is second to none in the industry. This is the plant behind that reputation—a. plant dedicated to supplying your copper tube needs with a product of dependable, uniform quality that you can sell or install with complete confidence.

Here, in one of America's largest, completely integrated mills, specializing in the processing of copper tube from basic metal to finished tubing, Reading Copper tube is produced with the newest, most modern equipment known to metallurgical science.

Reading's unique 4-way inspection checks and certifies accurate adherence to the most exacting standards.

Reading's superior service and quality place you in a better position to supply your customers' needs —help you build your business. Next time you order copper tube, specify Reading—for quality and service you can depend on!

READING
TUBE CORPORATION
EMPIRE STATE BUILDING
NEW YORK 1, N. Y.

Distribution Depots:

- READING, PA.
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- HOUSTON, TEXAS,
  1121 Rothwell St.
- ATLANTA, GA.,
  690 Murphy Ave., S. W.,
  Unit 5, Bdg. B
- CLEVELAND, OHIO,
  4615 Perkins Ave.

READING
COPPER • BRASS
TUBE

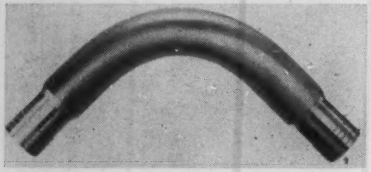
SOLD THROUGH WHOLESALERS ONLY

by a two cylinder compressor belted directly to the automobile motor.

Manufacturer — Wabash Mfg. Co., 2300 S. Western Ave., Chicago 8.

Elbow for Plastic Pipe

Elbow for plastic pipe is one piece with a long radius to give a minimum amount of resistance and a maximum flow of liquid through the fittings. . . . The elbow has a long tangent that goes through the seal connecting directly to the plastic pipe. These elbows are also supplied with a male pipe thread on one end to make a direct connection if rigid pipe is used above ground. Sizes range from ¾ in. through 1½ in.



Manufacturer — Capitol Mfg. & Supply Co., 153 W. Fulton St., Columbus 16, Ohio.

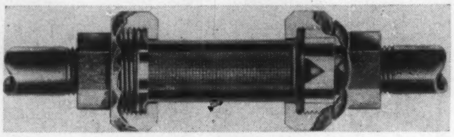
Direct Drive Fans

"Supervent" steel pressure fans in 16 and 24 in. hub diameter models with capacities of 50,000 cfm to 120,000 cfm. . . . Fan diameters range from 32 to 96 in. Featuring a direct drive design, the fan and motor are an integral unit with no drive shaft, belts or gear box. According to the manufacturer, the unit features lifetime silicone lubrication.

Manufacturer — The Moore Co., Marceline, Mo.

Water Saving and Proportional Control

Water line flow volume "Mesurflo" control designed to maintain one set flow rate regardless of variable inlet pressures. . . . The company states that this control will automatically compensate for surges in line pressure. Pressure drop is preset to deliver one constant rate between 0.2 gpm and 14 gpm. It is available in ¼, ⅜ and ¾ in. pipe sizes.



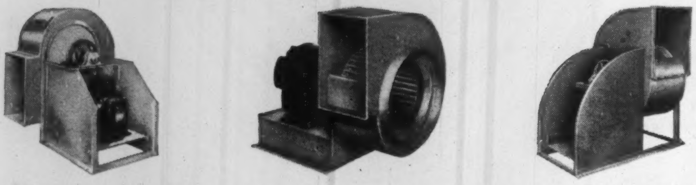
Manufacturer — Hays Mfg. Co., Industrial Sales Div., 816 W. 12th St., Erie, Pa.

Diffuser Type Air Grille

New "APV-QO" series diffuser type air grille. . . . Adjustable scoop type air proportioning vanes are designed to balance the air volume for a given supply outlet. The manufacturer states that a quick opening feature provides for extracting air without the scoop

UTILITY TYPE VENTILATING SETS
The MASSACHUSETTS *Line*®

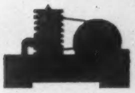
PROBLEMS ARE SOLVED when "The MASSACHUSETTS Line" enters the picture.

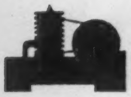


Bulletin No. 109 Catalog contains certified ratings authorized by NAFM as applied to type MSV belt drive and type S direct drive sets. These economical package type units are furnished ready to install to duct work and electrical connections. Accessories available include hood covers, automatic shutters mounted in fan discharge and outlet control damper. The new MSV size 30 design 3 has a rugged squirrel cage type wheel and is rapidly gaining popularity.

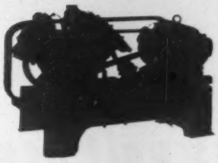
MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK *Mfg. Co.*
4901 HAMILTON AVENUE • CLEVELAND 14, OHIO

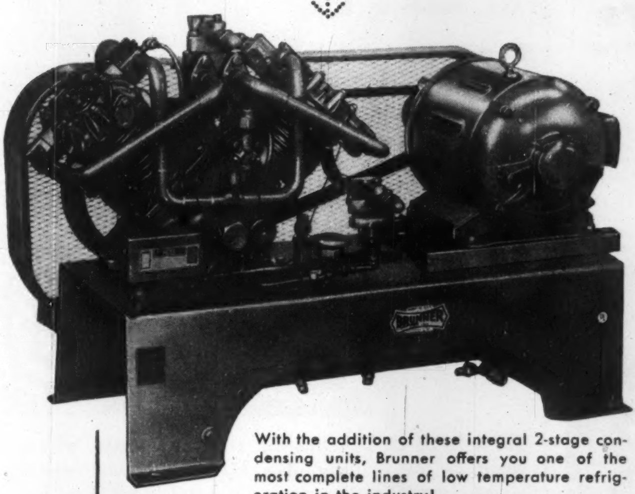
why use two





when one will do ?





With the addition of these integral 2-stage condensing units, Brunner offers you one of the most complete lines of low temperature refrigeration in the industry!

Complete Specifications Now Available!

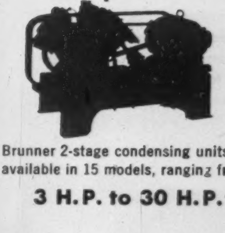
. . . Ask your Brunner representative or wholesaler . . . or write us!

BRUNNER INTEGRAL 2-STAGE CONDENSING UNITS OFFER NEW EASE AND ECONOMY IN LOW TEMPERATURE APPLICATIONS

Now—with these integral 2-stage Brunner units—you can easily handle, with *one* unit, many low temperature applications that formerly required hook-ups of two or more condensing units! Designed for use with both F-12 and F-22 refrigerants, these Brunner units have ratings as low as −100°. Ideal for use in cold test chambers, frozen food, metal processing and other jobs where sub-zero temperatures are desired. Saves time and dollars on installation and maintenance costs, too...

BRUNNER MANUFACTURING CO., Dept. L-74, UTICA, N.Y.

The Brunner Company, Gainesville, Ga.
In Canada: Brunner Corp. (Canada) Ltd., Toronto, Ontario



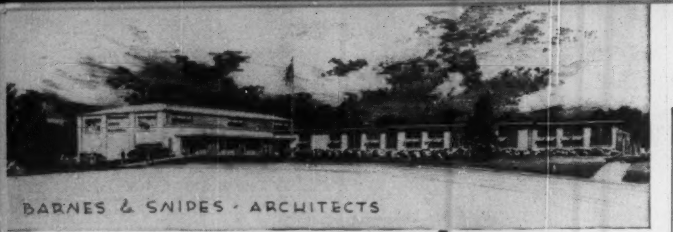
Brunner 2-stage condensing units are available in 15 models, ranging from:

3 H.P. to 30 H.P.

BRUNNER SINCE 1906 *means more in '54*

As seen in The Saturday Evening POST

BRUNNER REFRIGERATION IS ADVERTISED IN THE SATURDAY EVENING POST



Heating Installation by Hausgas, Inc., Washington, Mo.

"Janitrol gas unit heaters helped us build within our budget"

... Statement by Mr. James Dawson, Supt. of Schools, Crawford County, Bourbon, Missouri.

"By using Janitrol Gas Unit Heaters instead of a central heating system, we saved enough to build within our budget. Installed in September, the 17 Janitrol Unit Heaters have proved highly satisfactory!", said Mr. Dawson.

The teachers, too, are very happy with this heating system. Each room being thermostatically controlled, each teacher can maintain any desired temperature.

Why not consider the *practical money-saving advantages* of Janitrol Unit Heaters for your requirements . . . whether for a new plant, a remodelled building or to replace an obsolete heating system that is costly to maintain and operate?

Bruce F. Barnes, of the firm of Barnes and Snipes, architects, writes, "The reasons for considering your equipment included economy of installation and flexibility of handling the heating problem. Savings over other equipment approximate over 50%."

Janitrol
GAS-FIRED UNIT HEATERS

Write today for your copy of Businessman's Blue Book of Better Heating. It gives numerous examples of correct unit heater installation practices for many types of buildings.

Janitrol Division of
SURFACE COMBUSTION CORP.
Columbus 16, Ohio
In Canada: Alvar Simpson Ltd., Toronto 13, Canada

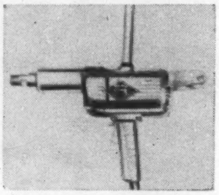
ALSO MAKERS OF
Surface INDUSTRIAL FURNACES **Kathabar** HUMIDITY CONDITIONING

entering the main duct over 2½ in., thus insuring reduction of air velocity and even distribution over the face of the outlet with full shut off possible. Air volume control is provided separately or attached directly to a ceiling outlet or air diffuser.

Manufacturer — Air-Factors, Inc., 1624 S. Raymond Ave., Monrovia, Calif.

Electric Hammer

"Demo" electric hammer, designed to deliver 6000 blows per min and to rotate at 1000 rpm, for roughing-in through concrete, rock and wood for all types of heating and air conditioning installations. . . . It weighs 9½ lb and drills faster, more accurate holes

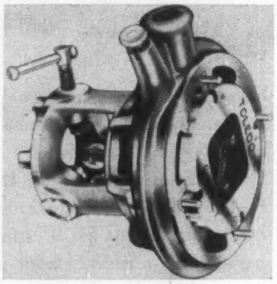


from 3/16 to 1½ in., the company states, giving as an example the drilling of a 1½ in. hole in concrete to a depth of 2 in. in less than a minute. No more than 25 lb of pressure is needed in drilling, according to the manufacturer. The unit is equipped with tempered carbide core bits with adapters and extensions for drilling holes to almost any desired depth.

Manufacturer — Davrus Corp., Box 1221, Joliet, Ill.

Threader with Pipe Holder

The "Simpact" self contained ratchet threader now offered with an improved cam-type quick action pipe holder . . . . The new holder has broader jaws to permit more positive grip on the pipe, and a free action



cam that sets instantly to size, the manufacturer states. Setting of high speed steel dies can be made to four pipe sizes, 1 to 2 in.

Manufacturer—Toledo Pipe Threading Machine Co., 1445 Summit St., Toledo 4, Ohio.

Square Air Diffusers

Adjustable square air diffusers with built in equalizing deflectors and rectangular air diffusers for 2, 3, or 4 way diffusion . . . . The "Type H Flexiflo" square series is manufactured in styles for plaster or acoustical tile ceiling installations. The adjustable vanes

SAFETY FILM
XX
SUPER-XX
2-B

how

FILM MAKERS CUT CASTING, CHILLING, DRYING COSTS

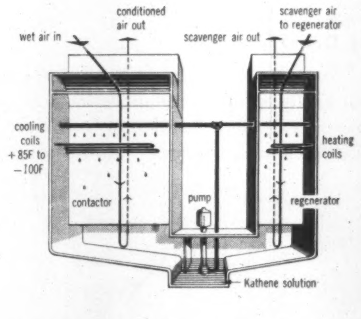
The leading manufacturers of photographic film and paper needed dry air at low temperatures for their casting, chilling, and drying processes. And they wanted it *without* frost, excessive reheating or aftercooling, high power requirements, carry-over, corrosion, and high maintenance and service costs.

They obtained air at the precise conditions they wanted by installing Kathabar humidity conditioning units, and avoided problems common to other dehumidification systems. For the casting process, where film dope changes from a viscous liquid to a transparent strip, Kathabar units deliver air at 104F and 47.5 grains/lb. with 53F water. For chilling the emulsion, they deliver air at 6.5F, 5 grains/lb., frost-free with 0F refrigerant. For drying the emulsion, they provide 140F, 36-grain air, with 75F water.

The results have been better process control, improved product quality, and lower costs. One manufacturer, for example, saved $40,000 annually in excess refrigeration by using Kathabar units for drying photographic paper.

Similar results have been achieved with Kathabar units in other industries: foods, pharmaceuticals, petrochemicals, brewing, glue, candy, atomic energy, lithography. For details, write for Literature Group K54-1C, including our just-published brochure, "HUMIDITY CONDITIONING."

WHAT COULD BE SIMPLER?



Air to be conditioned passes through the contactor, where an absorbent solution removes moisture (the amount depends on the automatically-controlled temperature of the solution). In the automatic regeneration, about 15% of the solution is heated, and the moisture it releases is blown out the window.

Kathabar®
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF **Surface** INDUSTRIAL FURNACES **Janitrol** AUTOMATIC SPACE HEATING

For Easy Pipe Threading
2½" to 4"... it's the 4P
RIDGID

THE RIDGE TOOL CO. ELYRIA OHIO
Every 4P TESTED for Perfect Threads before shipment

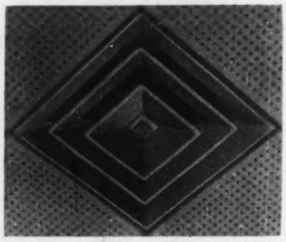
RIDGID 4P is easy to carry, easy to put on pipe

Balanced loop handles make it a cinch to carry and swing up on a pipe. Besides, the mistake-proof workholder sets to size before you lift it—only one screw to tighten on pipe. Easy upkeep—drive pinion in oilless bronze bearing; safe enclosed gear. 4 sets of 5 high-speed steel dies, 2½", 3", 3½", 4". Ratchet handle. RIDGID drive shaft available. Save work—buy 4P at your Supply House.

The Ridge Tool Company • Elyria, Ohio, U.S.A.

RIDGID
Work-Saver Pipe Tools

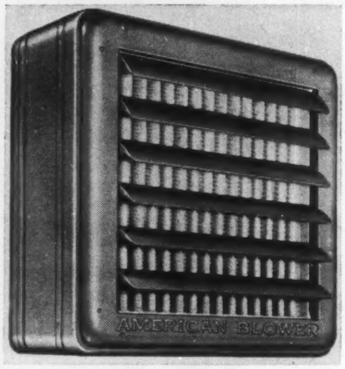
increase or decrease volume as desired without auxiliary dampers. Six sizes are available from 4 to 16 in. neck diameter. The "Type MP Multi-Pattern" rectangular series uses the same blade form as the square model and is designed for use in areas of rectangular shape.



Manufacturer—Universal Diffuser Corp., 1360 Garrison Ave., New York 59.

Unit Heaters for Steam or Hot Water

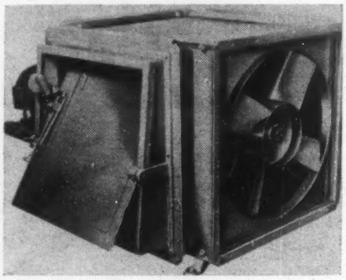
Redesigned line of unit heaters for steam or hot water operation. . . . The heaters are built in both the horizontal and vertical types in a wide range of sizes for industrial or commercial applications.



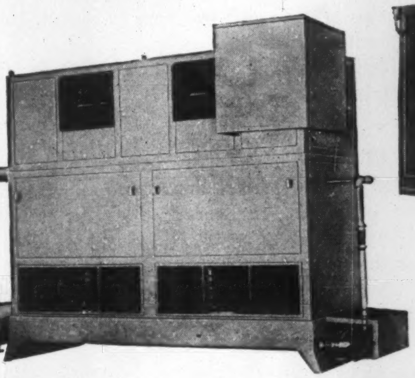
Manufacturer — American Blower Corp., Detroit 32.

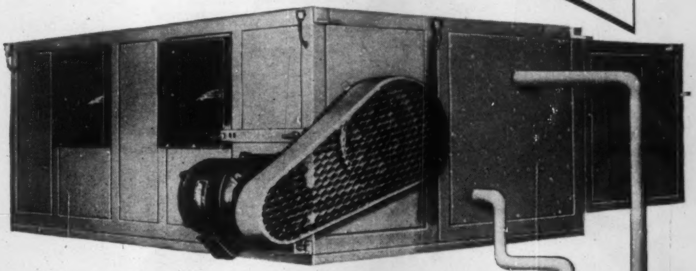
New Design for Draft Inducer

New design of the furnace draft inducer . . . . Main features include interchangeable side panels, movable mounting feet, motor and fan assembly completely withdrawable, spring mounted motor and v-belt drive to prevent misalignment, variable speed motor for precise draft control and pre-sealed bearings to eliminate



THE KENNARD *Engineered* LINE COMPLETES THE JOB





KENNARD AIR CONDITIONING BLOWER UNITS

are adaptable to all forms of air conditioning installations. 13 sizes, 400 to 21,600 C.F.M. Vertical or Horizontal.

KENNARD EVAPORATIVE CONDENSERS AND COOLING TOWERS

meet present day demands for efficient water saving. Rugged enough for Outdoor, quiet enough for Indoor, 3 to 75 tons.

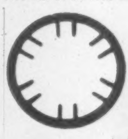
Complete the job with other KENNARD products

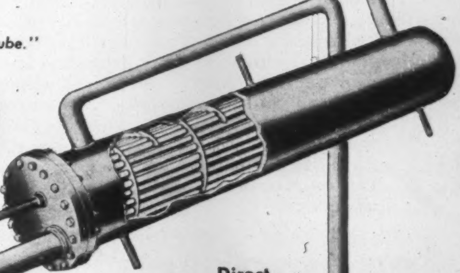
Coils—Cooling or Heating.
Multi-Zone Air Conditioning Units
Heating and Ventilating Units
Sprayed Coil Dehumidifiers
Cooling Towers

OUR 20th YEAR
AIR CONDITIONING EQUIPMENT
1934 1954
KENNARD CORPORATION
ST. LOUIS MISSOURI

"It's in the fin and the fin is in the tube."

Cross Section of Chiller Tube developed by KENNARD.
Pat. Applied For.

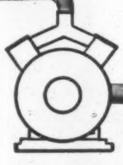




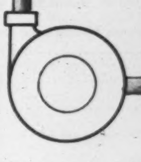
Direct Expansion Freon 12-22

KENNARD SHELL AND TUBE LIQUID CHILLERS

Revolutionary internally finned tubing (exclusive with KENNARD) makes them better than 50% lighter and smaller—positive oil return—no Freon head gasket—smaller Freon charge. Sizes 2 to 200 tons.

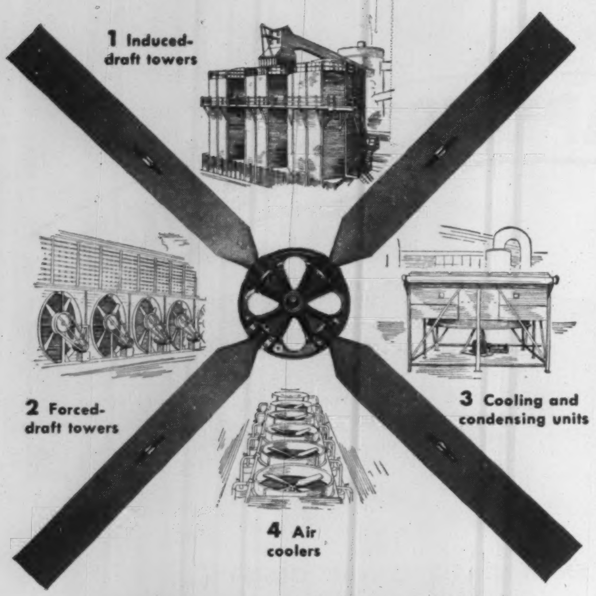


Compressor *(by others)*



Pump *(by others)*

KENNARD CORPORATION
1817 S. HANLEY RD. • ST. LOUIS 17, MO.



AEROMASTER FANS
First choice for all four

Ask the manufacturer . . . *ask the user* . . . what fan he prefers for his cooling equipment. Chances are he'll say Aeromaster.

Why? Because he knows from experience that Aeromaster Fans can be relied upon to give good service.

Aeromaster Fans are *precision-engineered,* adapted from high speed aircraft propellers. They have adjustable blade pitch and anti-flutter design . . . therefore, require less horsepower. And they last longer too, thanks to the exclusive Aeroloid blade coating to resist acids and alkalies, abrasion and weather. Overall result: Aeromaster Fans *give more cooling at lower cost.*

Available in 4, 6, or 8 blade styles, in diameters of 5 to 24 ft., with capacities up to 1,000,000 cubic feet per minute, all Aeromaster Fans are fully guaranteed.

Koppers also has trained engineering specialists available in principal cities, insuring prompt, expert Aeromaster Fan service. And Koppers is always ready to consult with you on special fan problems. Next time you plan a replacement of present fans, specify Aeromaster. And when you consider new equipment, call on Koppers . . . always eager to be of service.

KOPPERS ®

Aeromaster Fans

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC.
BALTIMORE, MD. This Koppers Division also supplies industry with Fast's Couplings, American Hammered Industrial Piston and Sealing Rings, Koppers Electrostatic Precipitators and Gas Apparatus.
Engineered Products Sold with Service

MAIL COUPON TODAY FOR COMPLETE INFORMATION

KOPPERS COMPANY, INC., *Aeromaster Fans*
247 Scott St., Baltimore 3, Md.

Gentlemen: Please send me detailed information on Aeromaster Fans for .... (name and type of equipment to be cooled).

Name ....

Title .... Company ....

Address ....

City .... Zone ...... State ....

EQUIPMENT DEVELOPMENTS

Continued

periodic lubrication. The draft inducer has a wide capacity range to loads of 100,000 lb per hr.

Manufacturer—L. J. Wing Mfg. Co., 140 Vreeland Mills Rd., Linden, N.J.

EQUIPMENT BRIEFS . . .

GAS CONVERSION BURNERS, "Y Series," equipped with electronic controls . . . . The burners have box or plate type air adjustments and may be installed in single or multiple units.

Manufacturer—Adams Mfg. Co., 1530 St. Clair Ave., Cleveland 14.

POCKET THERMOMETER REFILL with "magna-lens" . . . . The company states that it fits all vest pocket thermometer cases and registers −30 F to +120 F. The magnifying lens gives an extra wide band filled with blue spirit so that it can be easily read.

Manufacturer—H. L. Prouse Co., R.D. 2, Rt. 38, Moorestown, N.J.

PORTABLE FAN for cooling factory personnel by having the air move over the people . . . . Other applications include spot drying for manufactured products and spot exhausting of steam, smoke and fumes. Units are available in diameter sizes of 24 to 48 in., air capacities from 4360 cfm to 32,400 cfm.

Manufacturer—M & E Mfg. Co., 2539 Winthrop Ave., Indianapolis.

AUTOMATIC PRESSURE LUBRICATOR operated through a coil spring pressure controlled by a moving piston with a metering pin to maintain a uniform flow as the spring expands . . . .A visual extending rod shows when refilling is required and indicates the flow of grease or heavy oil from the lubricator.

Manufacturer—Bronze Bearings, Inc., 520 North Ave., Cranford, N.J.

PORTABLE ARC WELDER weighs 65 lb and operates on either 110 or 220 volts a-c, 60 cycles with a rated output of 200 amp . . . . The manufacturer states that a new high efficiency transformer is used in the welder. Known as the "Bren/Weld," it handles electrodes from 3/64 in. to 5/32 in., using either the metallic or carbon arc process.

Manufacturer—Brennen, Bucci and Weber, Inc., and distributed by Kasson Die & Motor Corp., 32-14 Northern Blvd., Long Island City, N.Y.

PRESSURE-SENSITIVE TAPE, made of aluminum foil, for industrial sealing, splicing, electroplating, conduction and heat reflection applications . . . . Tape "No. 425" is made with a dead-soft aluminum foil backing coated with a thermosetting adhesive. Most popular use is reported to be for sealing butt splices of foil backed insulation batts.

Manufacturer—Minnesota Mining and Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

TWENTY-FOOT LENGTHS of 10″ I.D. copper tubes receive final inspection in one of the mills of The American Brass Company. ANACONDA Seamless Drawn Copper Tubes are made up to 26″ I.D.

Anaconda Copper Tubes last longer... can actually lower your plant piping costs

Planning a new installation? Want to replace unsatisfactory piping? Then look into the cost and performance advantages of ANACONDA Copper Tubes *first*. Many plants have found them the *least costly* piping material available.

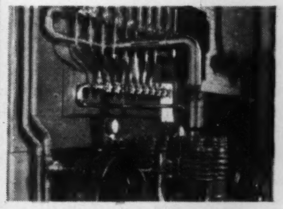
Here's why: ANACONDA Copper Tubes are light. They come in long lengths. Smaller sizes are bent right on the job. All this means big savings on installation costs. And copper tubes can't rust. They resist corrosion and guard against contamination. Smooth interiors mean smoother flow. Pumping costs are often lower.

Here's another advantage. ANACONDA Copper Tubes — connected with solder-type fittings — can be taken down, moved or have new connections cut in faster than with threaded pipe. *You can meet changing plant conditions easily.*

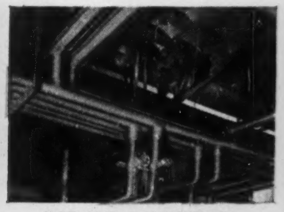
If we can be of assistance in solving a piping problem in your plant please write to: *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Limited, New Toronto, Ont.*

5446

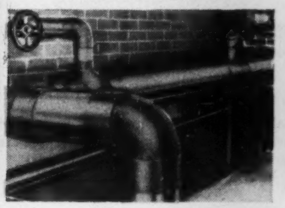
Use Anaconda Copper Tubes for:



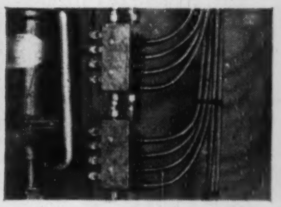
REFRIGERATION AND AIR CONDITIONING



HOT AND COLD WATER SUPPLY LINES



INDUSTRIAL HEATING LINES

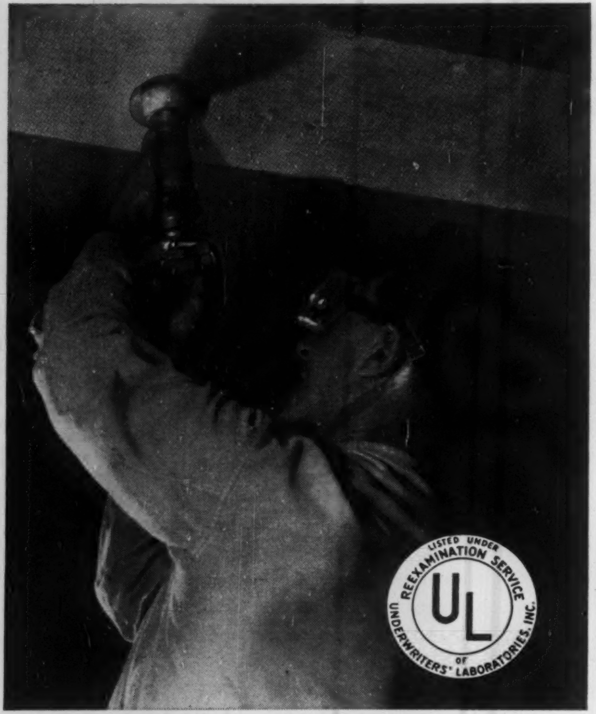


AIR, LUBRICATING AND HYDRAULIC LINES

for copper piping call an

ANACONDA

Distributor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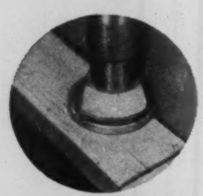
UL

DRIVE a better bargain in bid competition with the safer, action-packed VELOCITY-POWER DRIVER

Because getting the job done faster, for less, is important in today's bid competition, the speed and safety advantages of the Velocity-Power Driver are vital in your contracting picture.

With this tool, fastening and anchoring jobs are finished in seconds! Just load, position, fire! Job's done. Interchangeable barrels let you drive either ¼-inch or ⅜-inch studs from same firing unit. Wide selection of studs—and cartridges and studs are integral to eliminate time-wasting matching and fitting.

Safety features include a spring-loaded safety arm that prevents accidental discharge; permanently attached spall-shield; center-fire cartridges; color-keyed cartridges to assure right load for job; and a barrel design that avoids flash, ricochet, recoil. Write for details.



← Spall-shield can be retracted, or a portion of shield rotated out of the way for easier work in narrow spaces or close-to-the-wall jobs.

ALSO AVAILABLE

Velocity-Power Driver with separate spall-shield for extensive work in deeply recessed areas.

VELOCITY POWER TOOL CO.
201 NORTH BRADDOCK AVENUE
PITTSBURGH 8, PA.

RECENT TRADE LITERATURE..

Air Compressors

Bulletin A-72 covers "Series 100, Class WN-114" heavy duty air compressors for industry. The booklet contains complete information on construction and operation of the compressor. Illustrated are seven models of the compressor as a single unit for displacement capacities from 1186 to 1948 cfm, as well as twin units which furnish up to 3896 cfm.

Manufacturer—Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22.

Air Conditioning Fundamentals

A 28 page booklet titled *What You Should Know About Room Air Conditioners* has recently been released. Printed in non-technical terms, the booklet is intended to give dealers and consumers a better understanding of modern room air conditioning in general, what air conditioning is and what should be expected from a room air conditioner.

Published by—Dearborn Stove Co., P. O. Box 5527, Dallas, Texas.

Air Conditioning in Texas

The most recent issue (Vol. 10, No. 1) of *Aspiration*, an air conditioning quarterly published by the Anemostat Corp., is entirely devoted to the use of air conditioning in San Antonio and Amarillo, Texas. This is the second of a series on *The Air Conditioned State of Texas.* Part I dealt with air conditioning in Dallas and Houston.

Published by—Anemostat Corp. of America, 10 E. 39th St., New York 16.

Air Diffusers and Outlets

Three new catalogs cover the company's line of diffusers and outlets. Ceiling air diffusers are described in Catalog B60-101 and sidewall air diffusers are shown in Catalog LCF-AS-101. Catalog ECCO-103 is devoted to ceiling air supply outlets for evaporative cooling systems. Photos, diagrams and full page selection charts for each diffuser are included.

Manufacturer—Air-Factors, Inc., 1624 S. Raymond Ave., Monrovia, Calif.

Aluminum Heat Exchanger Tubes

The advantages of aluminum heat exchanger tubes are covered in a new 24 page booklet. The first part discusses the types of tubes and explains corrosion protection provided by cladding. The next sections report service and laboratory experience in the use of aluminum heat exchanger tubes with cooling waters, and discuss applications in various industries. A section on fabrication, including general design data and alloy recommendations, precedes a technical data section.

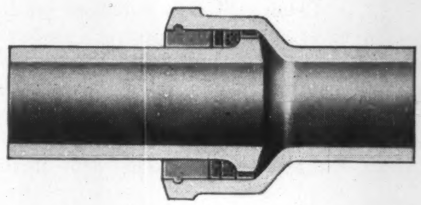
Manufacturer—Aluminum Co. of America, 728 Alcoa Bldg., Pittsburgh 19, Pa.

Boiler Water Columns and Gages

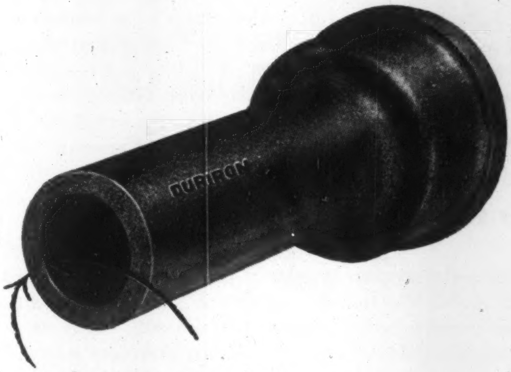
Recent improvements in the manufacturer's line of water gages are described in catalog WG-

Just remember that

Duriron Acidproof Drain Pipe



is installed by ordinary plumbing methods and



resists corrosion throughout the entire thickness of the pipe wall

Duriron, a high silicon iron alloy, is extremely resistant to most industrial and commercial corrosives—and resists abrasion and erosion, too. This resistance is not just "skin deep," but exists throughout the entire thickness of the pipe wall. That's why Duriron can be expected to outlast the building in which it is installed. Duriron pipe and fittings are available from stock in principal cities. Free Bulletin PF/4 gives complete details.

THE DURIRON COMPANY, Inc.

DURIRON
LOOK FOR THE NAME ON EVERY PIECE

404 North Findlay St.
DAYTON 1, OHIO

Now ready for you

Independent
REGISTERS
AND
GRILLES
CATALOG No. 54
THE INDEPENDENT REGISTER CO.
3747 EAST 93rd STREET · CLEVELAND 5, OHIO

the new

INDEPENDENT REGISTER AND GRILLE CATALOG No. 54

This new catalog—just off the presses—contains 36 pages. The catalog provides selection tables, weights, open areas, sizes and prices of the complete Independent Register line of grilles, cold air faces, registers, and ceiling outlets—including new registers for perimeter heating installations.

Your copy will be mailed to you promptly if you request it on your business letterhead.

Always Leading
★
Always Progressing

MEMBER
NATIONAL WARM AIR HEATING
INDOOR COMFORT
AND AIR CONDITIONING ASSOCIATION

THE INDEPENDENT REGISTER CO.

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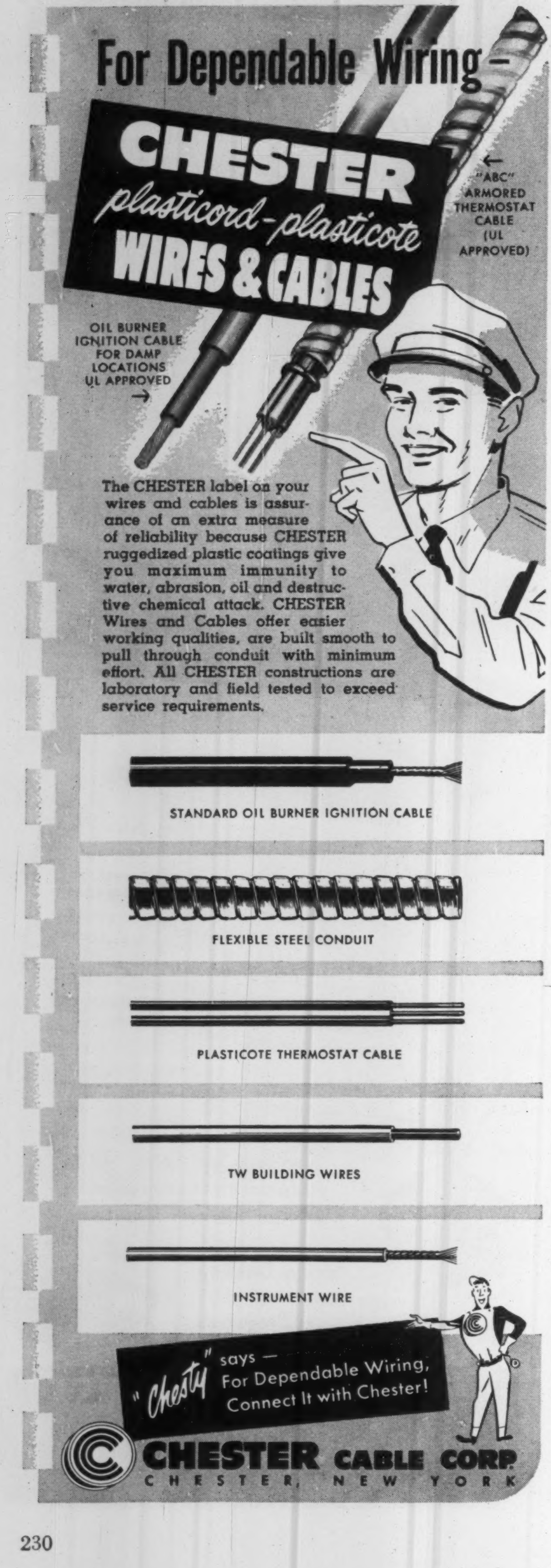

For Dependable Wiring—

CHESTER
plasticord-plasticote
WIRES & CABLES

"ABC" ARMORED THERMOSTAT CABLE (UL APPROVED)

OIL BURNER IGNITION CABLE FOR DAMP LOCATIONS UL APPROVED

The CHESTER label on your wires and cables is assurance of an extra measure of reliability because CHESTER ruggedized plastic coatings give you maximum immunity to water, abrasion, oil and destructive chemical attack. CHESTER Wires and Cables offer easier working qualities, are built smooth to pull through conduit with minimum effort. All CHESTER constructions are laboratory and field tested to exceed service requirements.

STANDARD OIL BURNER IGNITION CABLE

FLEXIBLE STEEL CONDUIT

PLASTICOTE THERMOSTAT CABLE

TW BUILDING WIRES

INSTRUMENT WIRE

"Chesty" says — For Dependable Wiring, Connect It with Chester!

CHESTER CABLE CORP.
CHESTER, NEW YORK

RECENT TRADE LITERATURE

Continued

1814. Described are the round glass gages for pressures up to 400 psi and the flat glass gages featuring separated design, floating assembly and inserts and "Type M" illuminators for pressures up to 2500 psi.

Manufacturer—Yarnall-Waring Co. 107 Mermaid Lane, Philadelphia 18.

Boiler Water Level Controls, Safety Devices

Catalog SC-5 is a revised edition of an earlier catalog covering the manufacturer's products. Some of the products covered include boiler feeders, low water cutoffs, pump controllers and relief valves. One large section deals with float operated valves and switches. Engineering information is given including capacity curves and roughing-in dimensions. Parallel data on the different models is arranged in tabular form for comparisons.

Manufacturer—McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18.

Centrifugal Pump Fundamentals

Centrifugal Pump Fundamentals explains the principles of operation, defines the various terms used in pump calculations and works out typical pump problems. Included in the booklet are sections on total head or pressure, specific gravity or weight of liquid, hydraulic and brake horsepower, and pump pressure.

Manufacturer—Ingersoll-Rand Co., Cameron Pump Dept., 11 Broadway, New York 4.

Cold Steam Washer

Four page folder illustrates and describes a hydro-air pressure washer. Compressed air is used to break water into minute particles so that a blast of air and water removes water soluble dirt and soil. It is used for rinsing after detergents and the manufacturer states there is no back splash. The folder contains photos showing it in use, specifications, and applications in various industries.

Manufacturer—D & M Products, Inc., 26 N. Raymond Ave., Pasadena, Calif.

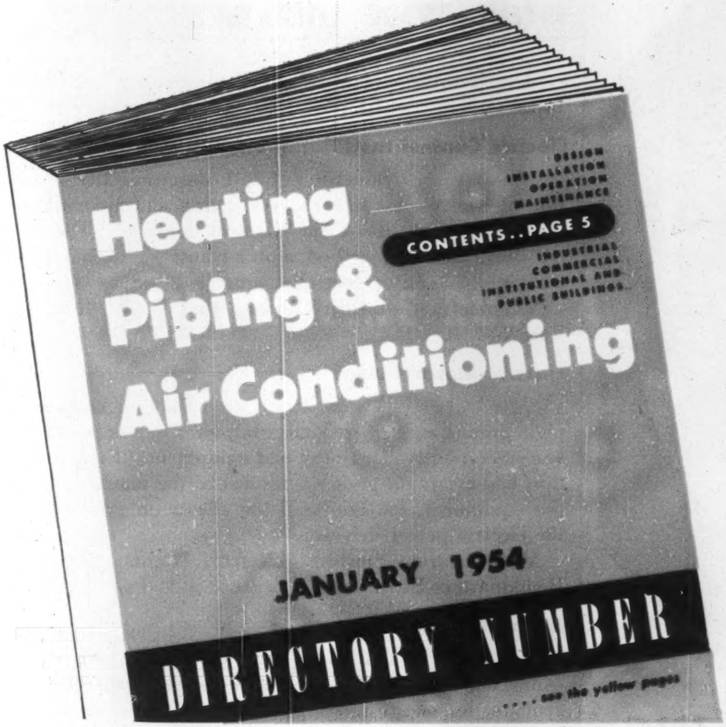
Commercial Cooling Towers

Catalog WT & CT-583 describes the operating characteristics of 20 of the manufacturer's commercial cooling towers ranging in capacity from 5 through 60 tons. Several pages are devoted to tables, drawings and graphs. Materials applied to the tower cabinet for protection against corrosion are described. Cutaway views and line drawings detail mechanical features of the cooling tower construction.

Manufacturer—Halstead & Mitchell, Bessemer Bldg., Pittsburgh 22.

Demineralization Process

Bulletin WC-111 comprehensively covers the chemical and mechanical factors in the design and operation of demineralizing plants for obtaining high quality process water and boiler feedwater. A typical ion-exchange unit is shown in a cutaway view. Also discussed are the piping and fittings for a demineralizing plant. Flow charts show demineralization systems for chemical plants and power plants.



Heating Piping & Air Conditioning

DESIGN
INSTALLATION
OPERATION
MAINTENANCE

CONTENTS . . PAGE 5

INDUSTRIAL
COMMERCIAL
INSTITUTIONAL AND
PUBLIC BUILDINGS

JANUARY 1954

DIRECTORY NUMBER

. . . . see the yellow pages

- **PRODUCTS CLASSIFIED**
- **TRADE NAMES**
- **MANUFACTURERS' ADDRESSES**

Here is Your Source of

COMPLETE PRODUCT INFORMATION

. . . Are You Finding It Useful?

If you are like the average subscriber, you will have near at hand—and frequently use—this January Directory Number of HPAC . . . . the field's complete reference guide to the products which engineers and contractors specify and purchase for the heating, piping and air conditioning work they handle.

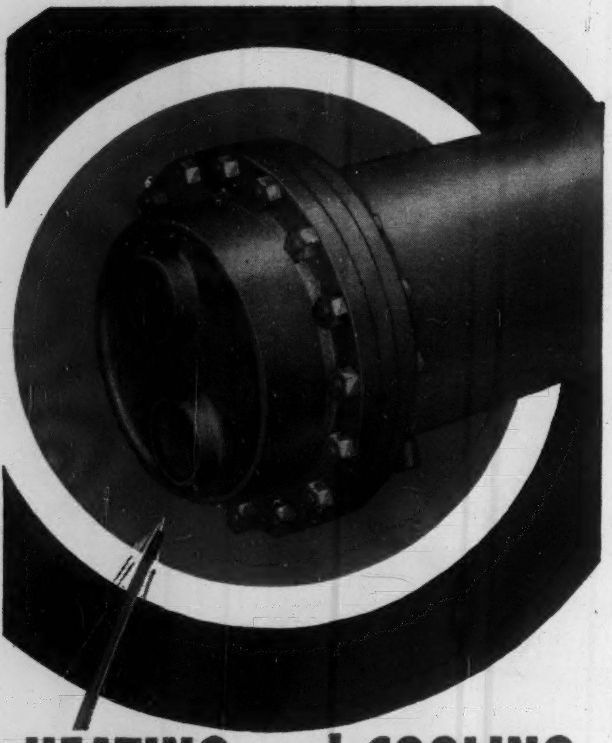
Each January you get a new, up-to-date HP&AC Directory Edition. It's a part of your annual subscription to our publication.

Have you any suggestions for making these editions *more* valuable? . . . . suggestions which we as publishers might adopt, or which we can pass along to the many manufacturers who co-operate with us by furnishing complete data on their products in each January Edition?

Your comments are sincerely welcomed.

Over 90% of those HP&AC subscribers answering a survey, stated that they found the January Directory Edition helpful in their work.

FIRST *in Editorial . . . in Circulation . . . in Advertising*



HEATING and COOLING EQUIPMENT at its RUGGED DEPENDABLE BEST!

—CONDENSATE COOLERS —WATER CHILLERS
—FREON CONDENSERS—FUEL OIL HEATERS
CONVERTERS—INSTANTANEOUS WATER HEATERS

Top quality design and construction assure you of long life, plus low operating and maintenance cost with Manning & Lewis heating or cooling equipment.

Standard sizes and models are available for most applications, as well as being furnished of material for normal operating service. Special conditions will be satisfied by M & L engineers upon information submitted by mail or directly to our field representatives.

Heaters or coolers will be supplied to A.S.M.E. code requirements upon request.

With Manning & Lewis Heating and Cooling equipment "The initial cost is the last cost."

Literature pertaining to the above equipment immediately available upon your request.

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Manning & Lewis Engineering Co.

M&L

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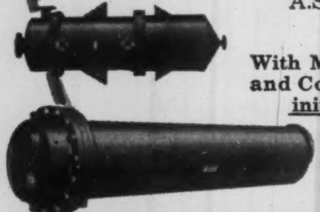


RECENT TRADE LITERATURE

Continued

Manufacturer—Graver Water Conditioning Co., 216 W. 14th St., New York 11.

Electric Control Installations

Bulletin F 526-1 describes the installation of controls for heating, ventilating and air conditioning with automatic electric "Control Centers." The bulletin illustrates the method and advantages of having all wiring in a building centrally controlled.

Manufacturer—Barber-Colman Co., 1228 Rock St., Rockford, Ill.

Electric Motor Drives

A new application bulletin contains 60 photographs of the firm's electric power drives installed on various types of machinery and equipment. Each illustration has a caption giving a resume of the manufacturer of the equipment, the user and the effects on production of the electric power drives.

Manufacturer—Sterling Electric Motors, Inc., Att: Headquarters Sales, 5401 Telegraph Rd., Los Angeles 22.

Exhaust Fans

Bulletin 500 describes axial flow, direct connected exhaust fans and includes performance charts, specification sheets and application data. Two new models described are roof exhausters and penthouses.

Manufacturer—M & E Mfg. Co., 2537 Winthrop Ave., Indianapolis, Ind.

Flexible Ducting for Air Conditioning

"Thermaflex" is a flexible, lightweight ducting designed for main line branches in both high and low pressure air conditioning systems. Engineering data sheets are supplied along with descriptions of the construction and characteristics of the ducting.

Manufacturer—Flexible Tubing Corp., Guilford, Conn.

Heating, Air Conditioning Accessories

A series of illustrated specification sheets on the manufacturer's product line have been bound into booklet form. Included are spray nozzles, pressure regulating valves, pipe line strainers, rotary pumps, fuel pumps, filters, and oil burner and air conditioning accessories.

Manufacturer—Eddington Metal Specialty Co., P.O. Box K, Eddington, Pa.

Ice Skating Rinks

Bulletin No. 198-F, *Ice and Frost,* contains photos of indoor and outdoor ice skating rinks throughout the United States and Canada. With the picture and description of each rink, there is an illustration and explanation of the type of ammonia compressor used.

Manufacturer—Frick Co., Waynesboro, Pa.

Insulating Mastic Coating

An illustrated bulletin describes the characteristics, recommended uses and application procedure for insulating mastic "Type 3X." The heat resistance and waterproofing properties are described.

Manufacturer—Palladium Mastic Corp. of America, Field Engineering Div., 327 Union Ave., Rutherford, N.J.

BANISH PIPELINE RUST AND CORROSION FOREVER
WITH
Boltaron®
6200

You can virtually eliminate maintenance and replacement costs with this non-metallic, lightweight, unplasticized Polyvinyl Chloride

Seamless pipe and fittings of Boltaron 6200 are corrosion-resistant throughout their entire body. You're assured of high flow characteristics because Boltaron can't rust or scale, is practically impervious to both strong and weak organic and inorganic acids, alkalies, alcohol, salt water and sulphite.

Highly workable, Boltaron 6200 can be bent, welded, sawed, threaded, flared or flanged. It is only half the weight of aluminum yet withstands considerable pressure inside and out and has good impact strength.

Available in 10′ and 20′ lengths, sizes ¼″ to 4″ schedule 40 and 80 wall. Standard, threaded I.P.S., fittings in sizes ¼″ to 2″.

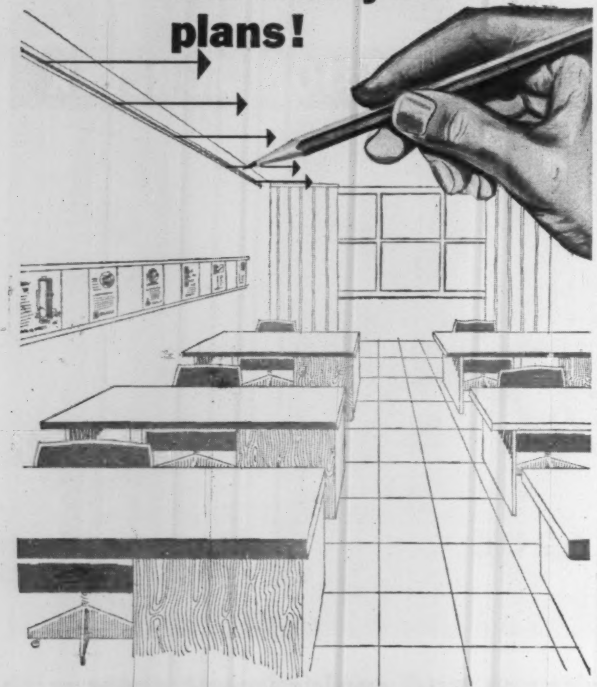
Boltaron 6200 may also be had in sheet, rod and block stock, and for special custom fabrications such as ducts, ventilating and exhaust systems, tank liners, etc. Experienced engineering facilities are available. Trained Boltaron representatives coast to coast and in Canada will work with you.

Write Box 809 for further information.

H. N. HARTWELL & SON, INC.
Industrial Plastics Division • Park Square Building
Boston, Massachusetts

NEED EXTRA SHOCK-RESISTANCE? Ask about high-impact strength Boltaron 7200 *Greenline.*

See how inconspicuously STRIPLINE fits into your plans!



Unlimited air distribution provided by slender continuous diffusers ...another AGITAIR first!

Stripline diffusers offer complete application versatility. They are ideal for installation in shallow lighting coves...window stools for air curtaining of glass windows or exposed wall areas...side of furred beams... or as a decorative border blanketing the entire area with noiseless, draftless air distribution. Custom built with AGITAIR's patented diffusing vanes, Stripline diffusers create maximum mixing and aspiration... quick temperature equalization and correct air distribution over any desired length.

Write for your free copy of Catalog S-100 today.

AGITAIR STRIPLINE

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.
AIR DIFFUSERS • FILTERS • EXHAUSTERS

RECENT TRADE LITERATURE

Continued

Mechanical Drive Turbine

Bulletin H-22 contains information on the firm's "Type YR" mechanical drive turbine. The bulletin gives emphasis by detailed illustration to design features and proper control of mechanical drive turbines. Modifications, specifications and dimensions are detailed.

Manufacturer—Elliott Co., Jeannette, Pa.

Mercury Plunger Relays

New catalog contains information on standard and heavy duty relays, including electrical characteristics and ratings. The relays are totally enclosed in hermetically sealed glass tubes to provide for safe operation. The plunger relays handle current loads up to 60 amp and motor loads up to 3 hp.

Manufacturer—Ebert Electronics Corp., 212-26 Jamaica Ave., Queens Village 28, N.Y.

Non-Plastic, Corrosion Resistant Coating

Bulletin No. 400 describes "Furan" flexible coating, which is unplasticized. The company states that this coating is prepolymerized and completes its polymerization, after application, without addition of a catalyst. The new bulletin covers application procedures to most types of surfaces, including rusty steel; technical explanations of film polymerization; general corrosion resistance; and features and uses.

Manufacturer—Carboline Co. Div., Mullins Non-Ferrous Castings Corp., 331 Thornton Ave., St. Louis 19, Mo.

Nozzle Guide for Oil Burners

The 1954 edition of the *Nozzle Guide* is a compilation of many manufacturers' specifications of nozzles for oil burners. Said to be the first listing of its kind, the booklet contains the manufacturers names, listed in alphabetical order, their nozzle model numbers, capacities in gph, spray angle and nozzle type. It is intended as a guide for servicemen in choosing the type of nozzle that will provide for the highest efficiency of an oil burner.

It is available for $1.00 from Wm. Steinen Mfg. Co., Accessories Div., 43 Bruen St., Newark, N. J.

Plug Valves

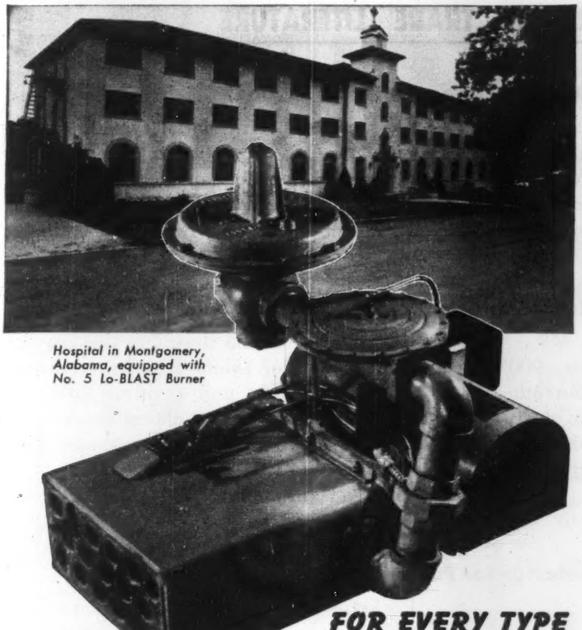
New 24 page reference book No. 39-5 illustrates and describes lubricated plug valves in full port and venturi types, sizes up to 14 in., and with a choice of self sealed, two piece plug or one piece plug designs. Engineering information includes principal dimensions, types of control, metals and lubricants.

Manufacturer—Homestead Valve Mfg. Co., P. O. Box 348, Coraopolis, Pa.

Process Timer

Bulletin GEC-1223 describes the operation, advantages and applications of the new "Type TSA-18" process timer. Connection diagrams for typical applications, as well as installation and cutaway illustrations, prices, specifications and dimensions are included.

Manufacturer—General Electric Co., 1 River Rd., Schenectady 5, N.Y.



Hospital in Montgomery, Alabama, equipped with No. 5 Lo-BLAST Burner

FOR EVERY TYPE OF BUILDING

LO-BLAST

IS THE GAS HEATING "BUY"

From coast to coast, you'll find Lo-BLAST Power-type Conversion Gas Burners heating buildings ranging from small residences to entire villages heated from a central plant. Preference for Lo-BLAST springs from proved efficiency, safety, durability . . . *operating records show an average saving of* 10%!

Compare these operating and construction features:

Power Burner Design. Perfect combustion, regardless of draft—a proved fuel saver. Safe and efficient for down-draft units.

Simple to Install. Every Lo-BLAST is factory tested on gas and shipped assembled.

Safe Operation. Lo-BLAST comes equipped with dependable, foolproof safetys.

Soft, Quiet Flame. No "pop" when the Lo-BLAST goes on or off—burns so smoothly you can hardly tell it's running.

Easy to Service. All parts are accessible—nothing in the firebox but the fire. Simplicity of design and durable construction reduce service to a minimum.

Long Lasting. Many Lo-BLAST Burners have been in operation 15 years without service.

Complete Capacity Range. Units available from 70,000 to 20,000,000 BTU input.

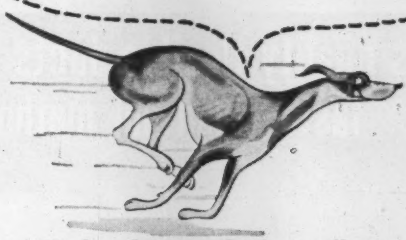
Lo-BLAST Economite

The "mighty-mite" of conversion gas burners—capacities from 70,000 to 500,000 BTU. All the famous design features of the larger Lo-BLAST packed into a low-cost unit for residential use. Write for descriptive literature.

This battery of Lo-BLAST Burners handles 11,000 sq. ft. of steam radiation plus 10,000 gallons of hot water per day.

MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

Here's why AGITAIR FM AIR FILTERS are so doggone popular!



High velocity...highest efficiency.

⅓ less space required.

Lower installation and maintenance costs.

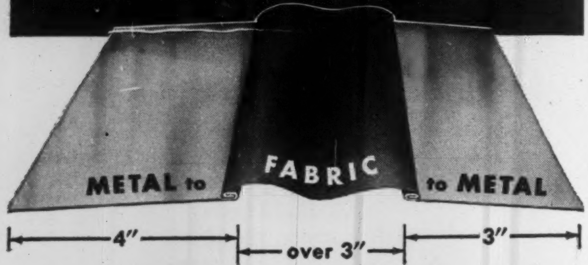
Long serviceable life.

Designed for an approach velocity of 530 fpm over the net media area, the high filtering efficiency of the AGITAIR FM increases as the dust load is applied. You save ⅓ in space required, in number of units to be installed and serviced. Very large dust-holding capacity of AGITAIR FM assures longer service periods, fewer cleanings per year, lower service charges. No exposed wire ends to cut or damage hands of service operators. Compare. Send today for free Cost Comparison Chart.

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

FILTERS • AIR DIFFUSERS • EXHAUSTERS

NEW! DURO
METAL-FAB
makes quality flexible ducts up to 70% faster than old methods



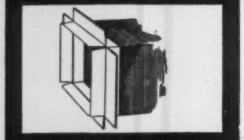
pre-assembled for you metal to fabric to metal!

ONE-PIECE FABRIC AND METAL DUCT CONNECTOR

- For your protection, exclusive "Double-Loc" metal-to-fabric seam
- Fastest, simplest money-saving way to fabricate flexible duct connectors
- Wide metal edges ample to form all types of joints (clinch, flange, slip, etc.)
- Finest engineer-approved materials used throughout
- Required flat lengths quickly pulled from Dispens-o-Flat carton. (Packed in 100 ft. rolls)
- Stops vibration noise in furnaces • blowers • air conditioners • attic fans, etc.
- Duro Stapler eliminates costly sewing of fabric
- Available in U.L. approved Canvas, Asbestos, Neoprened Fiberglas

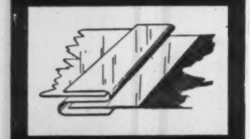
Write for DURO METAL-FAB Samples and Literature.

Typical types of connector made with DURO METAL-FAB



CLINCH COLLAR

FLANGE



SLIP

PAT. PEND.
UNION MADE

DURO-DYNE CORPORATION
800D Third Ave., New Hyde Park, L. I., N. Y.

RECENT TRADE LITERATURE

Continued

Regulators for Compressed Gases

Four page folder contains engineering specifications of regulators for most compressed gases. Several diagrammatic illustrations explain the construction and operation.

Manufacturer—K-G Equipment Co., Inc., 1744 Lehigh St., Allentown, Pa.

Room Air Conditioner for Small Spaces

Bulletin No. C-4.25 describes the "Spot-aire 900", an air conditioner for rooms with low ceilings and other space limitations. The unit requires little or no ductwork and no floor space. The bulletin features a photo of the new unit, a selection table, dimensional diagrams and a performance chart.

Manufacturer—Drayer-Hanson, Inc., 3301 Medford St., Los Angeles 63.

Selector for Fasteners, Discs and Charges

Pocket size selector aids in the proper application of fasteners, discs and charges used with powder actuated tools. The selector is designed so that a reading can be obtained by matching a sliding scale indicator with hardness and thickness data for each use in steel or concrete. Compact reference tables also indicate the proper charge.

Manufacturer—Ramset Fasteners Div., Olin Industries, Inc., 12117 Berea Rd., Cleveland 11, Ohio.

Solenoid Valves for High Pressure

High Pressure Bulletin covers a line of solenoid valves for high pressure applications. It illustrates features of bronze or stainless steel high pressure pilot operated and direct lift solenoid valves with diagrams of electrical circuits used for normally open and normally closed operations.

Manufacturer—Atkomatic Valve Co., Dept. H-108, 545 Abbott St., Indianapolis 25, Ind.

Sound Detector

Four page folder describes an electronic sound probe which changes vibrations into electrical energy, multiplies sound volume and transmits directly into earphones. Applications such as detecting trouble spots in machinery are described.

Manufacturer—The Gel-Me Co., P.O. Box 293, Bloomington, Ill.

Stainless Alloys

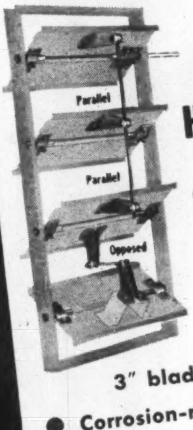
A technical booklet consisting of 11 reference sheets covering the major stainless alloys is now available. For each alloy the following information is given: chemical composition, mechanical and physical properties, resistance to major corrosive solutions, machinability, heat treatment and weldability. In addition, the equivalent ACI, AISI, SAE and ASTM designations are given.

Manufacturer—The Cooper Alloy Foundry Co., Hillside, N. J.

SAVE TIME, MONEY and MAINTAIN TOP QUALITY DURO-DYNE PRODUCTS

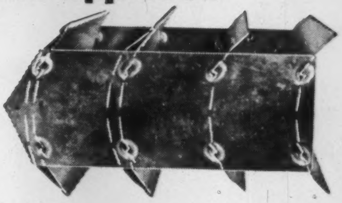
"DURO-BLADE KIT"

precision engineered
DAMPER HARDWARE



- Swiftest, simplest assembly
- Ideal for light or heavy dampers, 3" blades or wider
- Corrosion-resistant throughout
- Parallel or opposed blade action
- Can be screwed, bolted, riveted, welded, spot welded

the original, job-tested
"DURO-VANE RAIL"
fast, accurate least expensive way to make engineer-approved
AIR TURNING VANES
Installed Cost cut 50% to 70%



- Complete turning Vanes meet engineering specifications
- For Hollow or single Air Turning Vanes
- Eliminates layout
- Supplied in 8' lengths—200 ft. bundles

WRITE for Free new "Visual" Manual

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Dept. D, 800 3rd Ave. • New Hyde Park, N. Y.

TVC *Condensate Pumps*

LOW PRESSURE SYSTEM

LOW RETURN CONNECTION
LOW SPEED, LONG LIFE
CAST IRON RECEIVER
SINGLE OR DUPLEX

A SINGLE UNIT easily converted at any time to a DUPLEX UNIT

Specify the "Convertible" TVC in the 15 gallon receiver when ordering low pressure system condensate pumps.

Capacities from 500 to 10,000 sq. ft. E.D.R.

Available from Jobbers' Stock

The Single Unit TVC Condensate Pump in a 15 gallon receiver can be converted to a DUPLEX UNIT whenever load or other conditions require. Each receiver is furnished machined and drilled for the addition of another pump and control.

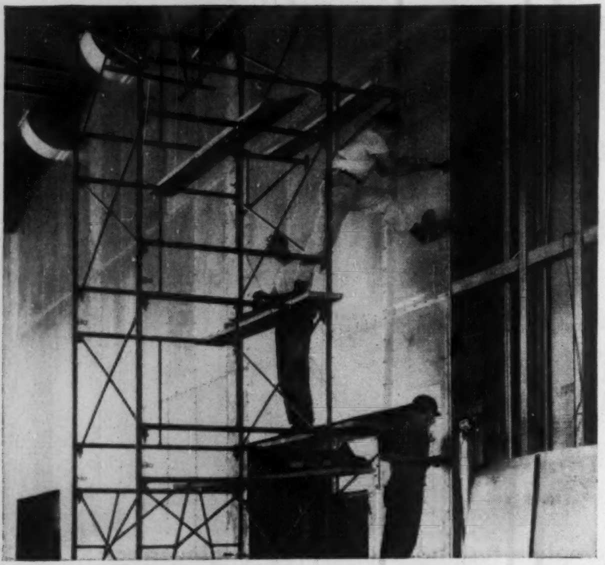
Conversion to a Duplex Unit doubles the capacity of the unit, or where desired, provides a stand-by pump. Additional pump is installed right on the job. Removal of the unit is unnecessary.

- **Dimensions**
15 gallon cast iron receiver for single or duplex units: diameter 25½", height of return above floor—7³⁄₁₆".
10 gallon cast iron receiver (for single units only): diameter 21", height of return above floor—6⅞".

- **Features**
TVC Condensate Pumps are low speed (1750 RPM) for long life, are readily installed in area where space is important. Their compact cast iron receiver and sturdy pumping unit assure a trouble free installation.

- **Installation**
Simple installation consists of connecting return line to receiver, and connecting discharge to boiler, using a check valve and a gate valve. Unit is completely assembled at the factory. Send for Bulletin TVC300.

weil PUMP CO. 1514 N. FREMONT ST. • CHICAGO 22



Saves 75% of fastening time by anchoring sheet steel wall with fast, easy *Ramset* system

About 20,000 individual fastenings were needed to anchor 4′ x 8′ 12-gauge perforated steel sheets to steel beams, to wall the paint hangar at the recently completed airplane plant of North American Aviation Corporation, Columbus, Ohio. The wall is required to permit adequate ventilation of 47,250 square feet of space, with a change of air every three minutes from air intakes and exhausts located on opposite sides.

Using RAMSET JOBMASTER fastening tools and Tru-Set drive pins, fastenings were made at a rate better than 50 per hour per man, or 1,200 per day for a three-man crew. This was at least 4 times faster than old-fashioned, conventional methods of drilling and setting studs in the beams. Not only was the work completed far sooner, but a substantial cost-reduction was realized.

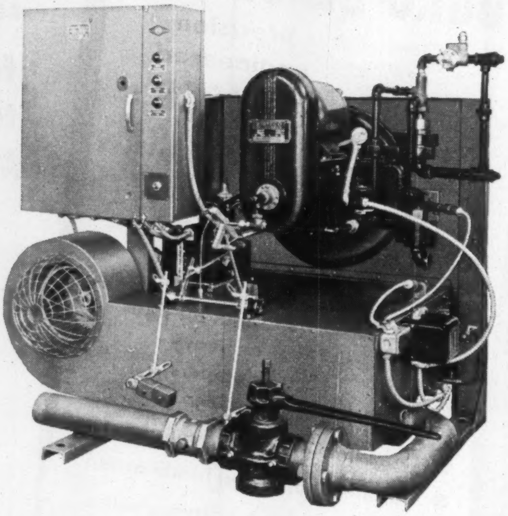
Similarly, RAMSET SYSTEM saves money and time on almost any job of fastening to steel or concrete for maintenance, modernization or new construction. Anchoring can be done in split seconds into the hardest concrete, or into mild steel up to 1″ thick, with the proper selection of tools, fasteners and power charges from the versatile RAMSET line.

Ask your RAMSET dealer how you can profitably apply RAMSET SYSTEM to your own work, or write us for details and *Specification Manual.*

Ramset Fasteners, *INC.* RAMSET DIVISION, OLIN INDUSTRIES, INC.
12109 BEREA ROAD • CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING AN Olin PRODUCT

WEBSTER ROTONETIC*



DUAL FUEL FIRING BURNER

- √ **Sizes from 75 to 300 horsepower.**
- √ **Minimum gas pressure requirements.**
- √ **Low installation costs.**
- √ **Maximum efficiencies on BOTH gas and oil.**
- √ **Minimum base height requirements.**
- √ **Utilizes all grades of fuel oil.**
- √ **Extremely low noise level.**
- √ **Approved electronic combustion safeguard system.**
- √ **Simpler changeover than ever before.**
- √ **One hundred per cent forced draft.**
- √ **Completely assembled, piped, wired and tested.**

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

Listed by Underwriters' Laboratories, Inc.

*TRADEMARK *Write for Literature*

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

Stock Refrigeration Equipment

Data sheet describes two new condensers added to the company's stock series—equipment which can be shipped immediately. It contains selection data, prices, shipping weights and dimensional diagrams of "Model CRF," a straight tube condenser, and "Model CFG," a shell and coil condenser.

Manufacturer—Bell & Gossett Co., 8200 N. Austin Ave., Morton Grove, Ill.

Temperature Conversion Guide

A pocket size chart of Fahrenheit and Centigrade temperature equivalents is available. The reverse side illustrates the company's thermometers.

Manufacturer—Moeller Instrument Co., 132nd St. and 89th Ave., Richmond Hill 18, N.Y.

Textile Resistant to Heat and Chemicals

New booklet describes "Teflon" tetrafluoroethylene fiber, resistant to heat and chemicals. Still in the experimental stage, projected uses include liquid and gas filtration fabrics, packing for pump and valve shafts, gaskets for flanged piping and other joints, and diaphragms for valves.

Manufacturer—E. I. DuPont de Nemours & Co., Wilmington 98, Del.

Time Delay Relay

A new two-step "Agastat" pneumatically controlled time delay relay is described in Bulletin SR 4. Model "NET" is designed to introduce either a sequence of time delay periods, or a momentary impulse, into an electrical circuit. The bulletin describes operating sequences, lists typical applications, and includes wiring diagrams and mounting dimensions.

Manufacturer—AGA Div., Elastic Stop Nut Corp. of America, 1027 Newark Ave., Elizabeth 3, N. J.

Time Switch for Air Conditioners

Booklet No. NR44 describes automatic control for room air conditioners. Covered is the operation of the "Inter-Matic" time switch, to which the air conditioner is attached so that the unit starts or stops at preset times. Also described is a skipping device to omit operation of the conditioner on selected days.

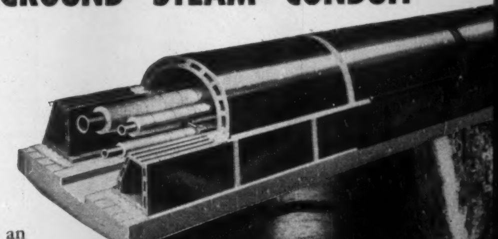
Manufacturer—International Register Co., 2624 W. Washington Blvd., Chicago 12.

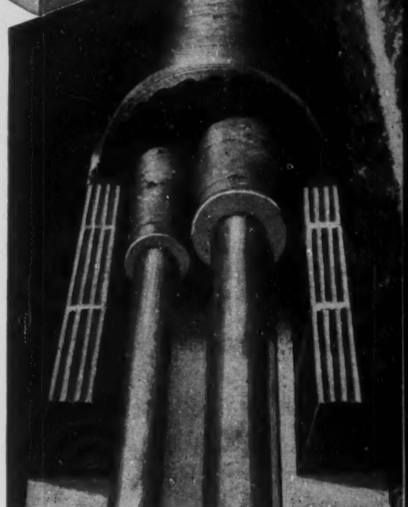
Turbines for General Use

Booklet B-3896 covers the complete line of "Type E" turbines in ratings through 1500 hp. Described are design and constructional characteristics as well as accessories. Application of these turbines as drives for pumps, fans, compressors, generators, paper making machines, beaters, coal pulverizers and line shafts is discussed. Specification and selection data is given.

Manufacturer—Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30.

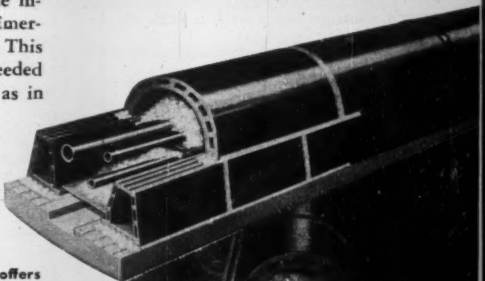
Therm-O-Tile
REG. U.S. PAT. OFF.
UNDERGROUND STEAM CONDUIT





At the right is shown an assembly view and an actual installation view of Therm-O-Tile Underground Pipe Conduit employing sectional pipe covering. The various sizes of Arch Tiles and Base Blocks in combination with special adjustable pipe supports make the assembly particularly economical when multiple pipes are installed.

The photograph below illustrates the employment of filler type insulation in an actual installation. The flexibility of this system makes for low initial cost without detracting from the high over-all insulation efficiency. Note the Asbestos Separator Plate which supports the insulation above the Emergency Internal Drain. This separator plate is not needed where covering is used as in the upper photograph.



Competes in Cost.
Although Therm-O-Tile offers numerous superior features it is nevertheless competitive in total first cost.

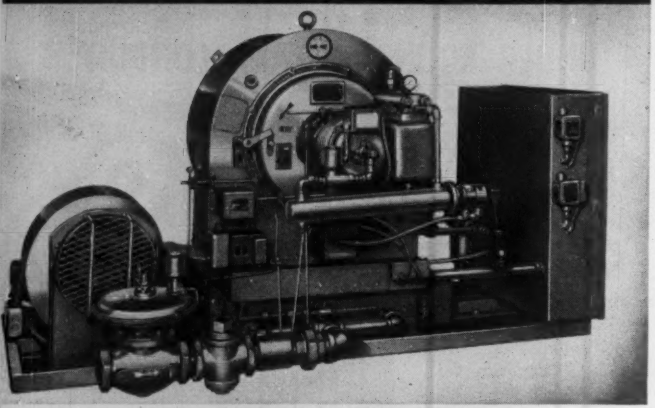
Specifications.
Recommendations, estimates of cost, and complete specifications for the conduit and insulation will be furnished by our engineers on any underground pipe line project upon request.

Bulletin 511.
This bulletin gives complete construction and technical details. Ask for a copy.

Johns-Manville.
Therm-O-Tile is represented by Johns-Manville Technical Service Units in all principal cities.

H. W. PORTER & CO., INC.
822-H Frelinghuysen Avenue • Newark 5, N. J.
REID HAYDEN, INC.
BALTIMORE, MD. RICHMOND, VA. CHARLOTTE, N. C.
Insulation Engineers & Contractors

COMBINED FOR EFFICIENCY!



RAY "FD" PACKAGED BURNERS

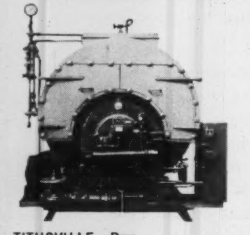
SCOTCH MARINE TYPE BOILERS

Ray "FD" burners are designed to be combined with Scotch Marine Type boilers to form a "packaged boiler-burner" unit for fully automatic operation on oil, gas or a combination of both.

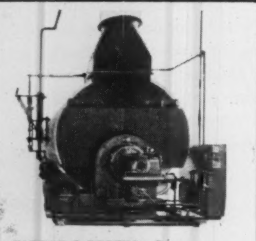
- **Complete range of sizes**—from 83 to 540 max. equivalent boiler h. p.
- **Compact**—burner extends only 30" to 43" from front of smoke box.
- **Combination Burner**—two ignition systems, change fuels with a flick of the switch.
- **Easy Installation**—Ray's packaged unit contains all combustion components completely wired, piped, and mounted on a structural steel base, ready to be installed on the boiler.
- **Forced Draft Air Control**—effects more rapid transfer of heat and higher efficiency without detrimental effects to firing tubes or heating surfaces of the boiler.

Write for complete details in catalog unit "Y"

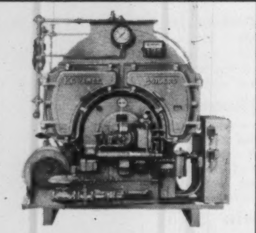
Typical Boiler-Burner Units



TITUSVILLE—Ray



FARRAR & TREFTS—Ray



KEWANEE—Ray

RAY
Since 1872
OIL BURNER CO.

1301 San Jose Avenue
San Francisco 12, California

Atlantic Seaboard Division
629 Grove St., Jersey City 2, N. J.

"A size for every job, a burner for every purpose"—Oil burners, Gas burners, Gas-Oil combination burners.

RECENT TRADE LITERATURE *Continued*

Valve Comparison Chart

A new valve comparison chart, listing valve figure numbers of 15 major manufacturers and the equivalent valve figure numbers of the publisher-manufacturer, has been released. The chart compares gate, globe, check and angle valves in bronze, iron, cast steel and forged steel. Lubricated plug valve comparisons include those made of cast steel and cast iron.

Published by—Ohio Injector Co., 275 Main St., Wadsworth, Ohio.

Welding Design

New edition of *Manual of Design and Welding Engineering* is a compact condensed booklet of the larger manual by the same name. The pocket-sized booklet contains detailed instructions on joint design. One section is devoted to overlaying and hard surfacing. Illustrations show proper methods of inspection and control.

Manufacturer—Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing 58, N. Y.

Wiring for Air Conditioning

A new folder, *What's the Big Idea in Air Conditioning in '54?*, points out opportunities for profit created by the great growth of air conditioning sales. The folder contains suggestions on upgrading air conditioning wiring jobs and tips on selling adequate wiring. Photographs, catalog numbers, electrical ratings and packaging information on wiring devices used in air conditioning and ventilating installations are contained in the folder.

Manufacturer—Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn.

BOOKS of reprinted material from Heating, Piping & Air Conditioning. You'll get same day shipment — postage paid — when you send check with book orders to Keeney Publ. Co., 6 N. Michigan, Chicago 2, Ill.

- ***INDUSTRIAL AIR CONDITIONING HANDBOOK***

Information on the purpose, cost, design, operation and maintenance of both process and comfort air conditioning systems in manufacturing plants of many kinds. The combined knowledge and experiences of 33 prominent engineers, every one a designer or in direct charge of the largest factory air conditioning systems in operation. This shows other engineers how air conditioning helps speed production, improve products, increase worker efficiency and operate systems economically. 186 pages, $1.50

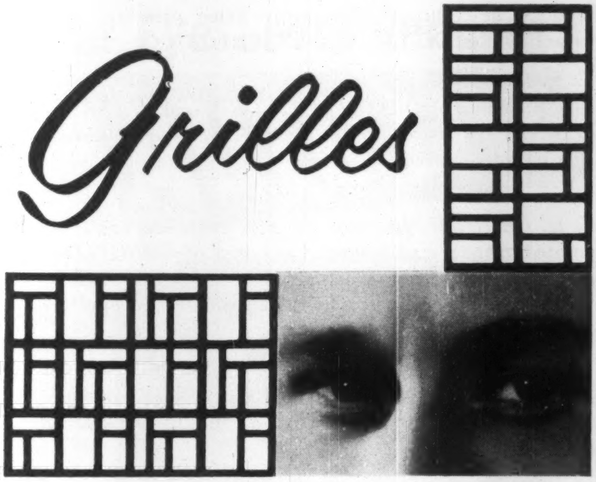
- ***INDUSTRIAL VENTILATION HANDBOOK***

A practical manual on fume removal, dust collecting, ventilating and exhaust systems for industrial plants. Tells how to design correctly and provide for various ventilation requirements . . . make measurements and analyses of fumes, mists and dusts . . . plan exhaust systems, etc. Twenty eminent authorities contributed also to detailed descriptions of systems in actual operation in many plants. 134 pages, $1.50

- ***SNOW MELTING MANUAL***

Complete information on correst design, installation and operation of snow melting systems is offered in this reprint of articles originally published in "Heating, Piping and Air Conditioning." Design data based on a study of—and others' actual experience with—over 100 snow melting systems of all kinds. Applications illustrated, for loading platforms and docks; sidewalks; roads; driveways; marquees; parking areas; runways; railway switches, etc. 20 pages, $1.00

Grilles



for that distinctive look

Just as eye-appealing as they are functional, Hendrick Perforated Metal Grilles will greatly enhance the beauty of your decorative motif.

They provide more-than-ample open area for the free passage of air, and are available in a wide variety of designs to best set off your decor. And they're easy to install because of a special flattening operation in their manufacture.

Over one hundred basic designs are available to choose from — many are obtainable only from Hendrick. Hendrick will gladly cooperate with architects to help select from a wide range of standard and special designs. For more complete details write Hendrick today!

SEE OUR CATALOG IN SWEET'S

Hendrick
MANUFACTURING COMPANY

48 DUNDAFF ST., CARBONDALE, PA. • *Sales Offices in Principal Cities*
Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids

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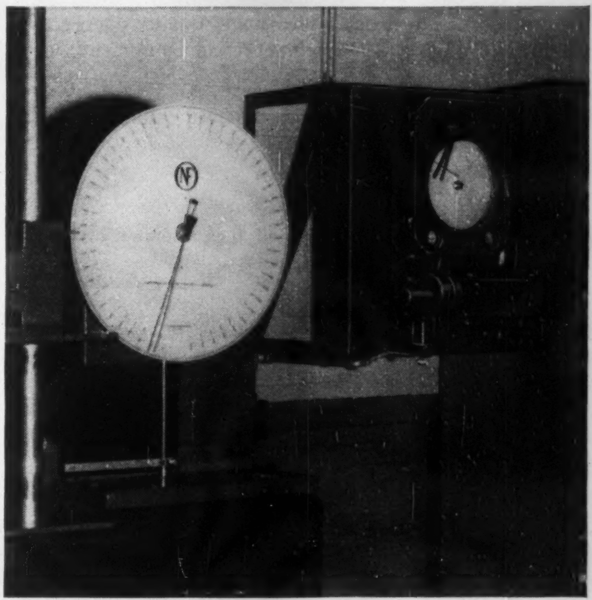
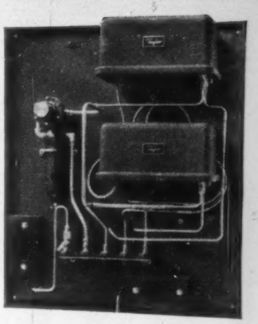
±1% HUMIDITY CONTROL

For Heating, Piping and Air Conditioning





Now your laboratory or test room can have humidity control on the basis of *percentage of relative humidity*—instead of on the individual performance of wet and dry bulbs. Taylor's Wet-and-Dry Bulb Temperature Controller (above) can maintain ±1% relative humidity. That means you have standard conditions for physical testing of products. This amazingly close humidity control is achieved by the Taylor FULSCOPE* Recording Wet-and-Dry Bulb Controller using as measuring systems two Taylor TRANSAIRE* Temperature Transmitters with SPEED-ACT* compensation for lags in heat transfer (see picture at left).

If your production requires close humidity control, it will pay you to look into Taylor Automatic Control with TRANSAIRE Transmitters. Ask your Taylor Field Engineer or write for **Bulletin 98140.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Trade-Mark

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST

WHO'S WHAT . . .

▶ The Weathertron Dept. of *GENERAL ELECTRIC CO.* has formed a sales and distribution planning unit headed by *WILLIAM G. COX*, who has been manager of product planning of the department and is succeeded by *WILLIAM B. HALL*.

▶ *WILDER MOFFATT*, design engineer at *BONNEY FORGE & TOOL WORKS*, has been named project engineer to coordinate manufacturing and quality control, research, and analysis of machinery and equipment.

▶ *ERNEST S. KOPECKI* has been named manager of public relations and promotion for the *SELAS CORP. of AMERICA*.

▶ *W. PAUL NOLAN* has joined the Machinery Div. of *DRAVO CORP*. as a sales engineer.

▶ *H. G. BAUER* has been named to the post of vice president and general sales manager of *DE LAVAL STEAM TURBINE CO.*

The company also has announced that *W. A. NEUMANN* has resigned as vice president in charge of sales to assume new duties as executive vice president and treasurer of the *DE LAVAL SEPARATOR CO.*

▶ New president of *DRYOMATIC CORP*. is *WALTER W. BOLTON*. He succeeds *W. B. HEINZ*, who continues on the board of directors.

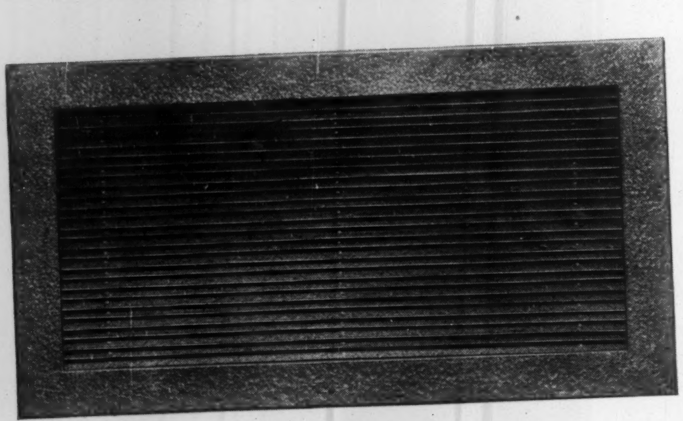
▶ *E. K. GRAHAM, JR.*, former chief engineer, has been appointed manager of technical services of *CONOFLOW CORP*. and will head a department created to handle specialized engineering problems in the sale and application of the company's equipment.

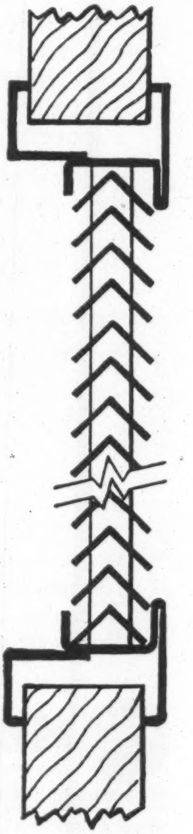
▶ *J. R. CONNELL* has been named assistant general purchasing agent of the Boiler Div. of the *BABCOCK & WILCOX CO.*

▶ Elected as president and a director of *STEWART-WARNER CORP*. is *BENNETT ARCHAMBAULT*.

▶ *THOMAS H. BRUMAGIN*, chief engineer of *AJAX FLEXIBLE COUPLING CO., INC.*, has been elected to the board of directors.

▶ *EDMUND H. LLOYD* has been appointed national representative for *JANITROL DIV*. of *SURFACE COM-*





- **CUTS INSTALLATION TIME OVER ½!**
- **EASY TO INSTALL** ***Anyone Can Do It!***
- **COMPLETE—NO WOOD MOLDINGS TO ADD!**

NEW! THIN CORE GRILLE FOR DOORS – PARTITIONS ¼" to ¾" THICK!

First Grille ever designed specifically for thin doors and partitions. Anyone can install it in just a few minutes time. No close tolerances required . . . almost a half-inch extra on sides for positioning. Telescoping auxiliary frame fastens to grille with posts and screws. Clamps tight. No holes to position. Practically no danger of ruining door. No wood moldings. All steel. Rattle-proof. No vision, with 80% free area. Available with or without frame, all sizes. Gray or tan prime coated, or Hammertone finish in gray or bronze.

→

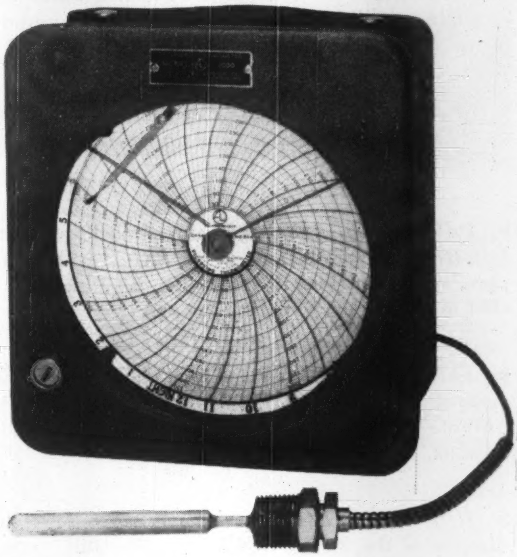
ACTUAL SIZE Cross Section

WRITE FOR OUR COMPLETE
FREE CATALOG
Listing Over 1000 Types and Sizes of Grilles for Every Requirement

A-J MANUFACTURING CO.
Dept. H-7 - 2119 Washington St. - Kansas City, Mo.

For Eye-Level Readings...

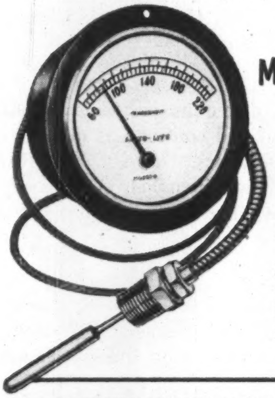
AUTO-LITE



Model 1000

TEMPERATURE RECORDER

This newly designed recorder has evenly calibrated, 6-inch chart... attractive die-cast case. Various standard ranges from minus 40°F to plus 550°F. Illustrated above is wall mounting type, with capillary tubing for remote reading. Also available with portable case with capillary and portable self contained. Obtainable with a cycle indicator for refrigeration.



Model G

TEMPERATURE INDICATOR...

Wide selection of dial ranges. Various mountings to meet your needs. Send for new catalog of Auto-Lite Recording and Indicating Thermometers.

THE ELECTRIC AUTO-LITE COMPANY
INSTRUMENT AND GAUGE DIVISION
TOLEDO 1, OHIO
NEW YORK • CHICAGO • SARNIA, ONTARIO

Tune in "SUSPENSE!"...CBS Radio Mondays... CBS Television Tuesdays

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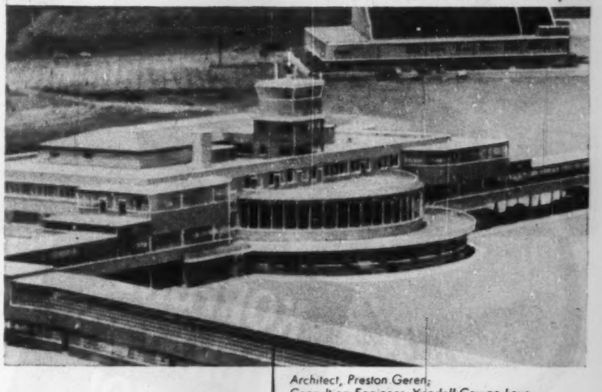
How Jenn-Air LOW CONTOUR exhausters cut costs 35%

Ft. Worth International Airport



Architect, Preston Geren; Consulting Engineer, Yandell-Cowan-Love, Mechanical Contractor, General Engineering Corp.

PROBLEM: To ventilate office, restroom and locker areas, holding costs at a minimum, conserving inside space, providing spot ventilation in building segments and blending equipment into beauty of structure.

SOLUTION: The adapting of two types of exhausters throughout structure . . . wall exhausters where structural make-up of building prevented going to the roof . . . roof exhausters where they could be spotted immediately over areas to be ventilated.

Low contour roof exhausters blend with architectural design of building.

Wall exhausters architecturally sculptured button design spots ventilation control.

Result: a saving of 35% in labor and material.

WHY JENN-AIR? Only Jenn-Air could offer the diversification and adaptability of two types of exhausters, fitting ventilation to building need, instead of the building conforming to the ventilation problem.

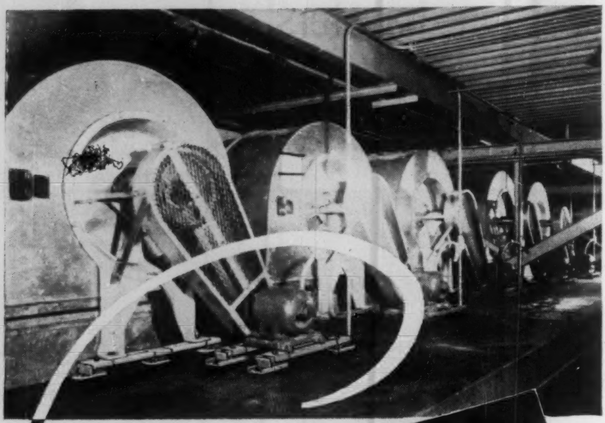
Low contour Jenn-Air Exhausters, made of ageless spun aluminum, are non-rusting — provide strength without weight. Next time consult Jenn-Air Ventilating Specialists on your ventilating problems.

JENN-AIR PRODUCTS COMPANY, INC.
Architects & Builders Bldg.
Indianapolis 4, Ind.

Jenn-Air Products Company, Inc.
Architects & Builders Building - Indianapolis 4, Indiana
Please send me your free catalog 53B.

name ____________
title ____________
company ____________
address ____________
city ____________ state ____________
HPAC

STOP VIBRATION



with KORFUND VIBRATION CONTROL

The photograph shows five of a total installation of 324 Clarage Heavy Duty Fans at The Upjohn Company's new pharmaceutical plant at Kalamazoo, Mich.

Korfund Twin Rail Bases under each fan and motor keep noise and vibration from reaching working areas through the steel deck or through the air conditioning ducts, and make possible this simple, space-saving installation on suspended platforms and structural steel members under the roof.

Korfund Duplex Twin Rail Bases have separate rails for fan and motor, and are completely adjustable—on the job—to take care of any drive center distance, motor position, bolt location or other variables. Built-in chocks assure positive alignment. Light weight, they are easier to handle. Base Drawings are immediately available for most fans and motors. And, because of standardization, long production runs reduce cost and permit quick deliveries.

For installation of fans, pumps, compressors, refrigerating and other types of mechanical equipment for both normal and critical operating conditions, basic isolation recommendations are given in Bulletin No. 15. Write for your free copy today, or see our catalog in Sweet's Files. Write, too, for one of our free Belt-Center Distance Calculators—it's a real time saver.

If you have a specific problem, we will be glad to submit recommendations without obligation. A half century of experience is at your disposal. Representatives in principal cities.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL SPRINGS RUBBER CORK

48-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

WHO'S WHAT

Continued

BUSTION CORP. and will serve as consultant to dealers on summer air conditioning problems.

▶ *LOUIS G. PACENT, JR.*, assistant to the vice president in charge of manufacturing of *EMERSON RADIO and PHONOGRAPH CORP.*, has been named works manager of *QUIET HEET MFG. CORP.* Emerson acquired a majority interest of Quiet Heet last October.

▶ *JOHN S. COPPAGE* has joined the sales deparment of the *PERMUTIT CO.* as manager of sales of the Chemical Service Div.

▶ *PAUL K. ADDAMS* has been re-elected president of the *OIL-HEAT INSTITUTE of AMERICA.* Mr. Addams, president of the Fitzgibbons Boiler Co., Inc., has served OHI in various offices during the past 20 years.

▶ *FENMORE E. DUNN* has been chosen as general manager of *WORTHINGTON CORP.'s* reorganized Vertical Turbine Pump Div. His headquarters will be at the Succasunna, N.J. works.

▶ *JOHN R. HERTZLER* has resigned as vice president and director of the *YORK CORP.*, effective July 31, after 28 years with the company. Replacing Mr. Hertzler as general sales manager is *RAY K. SERFASS*, who has been assistant general sales manager.

▶ At a meeting of the board of directors of the *MIDWEST PIPING CO., INC.*, *GUY L. MORRILL* was elected vice president. He will continue to make his headquarters in Los Angeles where he has been manager of the west coast plant since it was established in 1927.

▶ *RONALD N. CAMPBELL*, director of manufacturing at *AFFILIATED GAS EQUIPMENT, INC.*, has been elected a vice president of the corporation.

▶ *H. R. SALISBURY* has retired as president of *AIR REDUCTION SALES CO.* but will continue as director of the company's foreign subsidiaries. *J. H. HUMBERSTONE*, president of the Ohio Chemical and Surgical Equipment Div. of Airco, has been named successor to Mr. Salisbury.

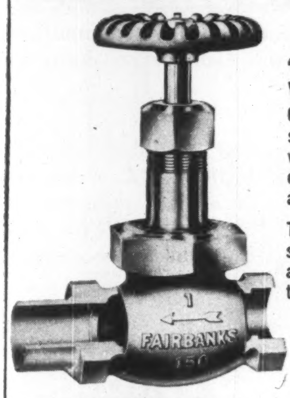
▶ *WAYNE E. HARGER* now is market research manager of *AMANA REFRIGERATION, INC.* and will conduct studies of room air conditioner marketing and merchandising trends.

▶ *FRANK L. LaQUE* has been elected vice president of the *INTERNATIONAL NICKEL CO., INC.* and manager of its Development and Research Div. He succeeds in both positions Thomas H. Wickenden, who has retired but

insure
permanent
leakproof joints

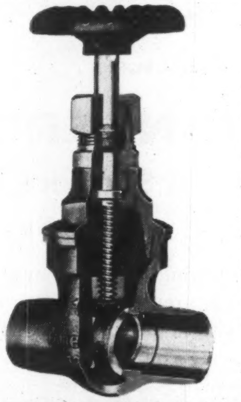
in copper
or brass piping

Fairbanks
THREADLESS
Valves



"Fairco-Braze" Threadless Valves for silver brazed joints. Cut costs, speed installation of piping systems handling steam, hot or cold water, oil, compressed air, carbon dioxide, Freon and many other liquids and gases.

The silver brazed connection withstands tension, compression, torsion and vibration to a far greater degree than any other type joint.



Solder End Threadless Valves for soldered joints. Get perfect seal of valves for type "K", "L" and "M" copper tubing with Fairbanks Solder End Threadless Valves. Simple, quick installation provides a smooth, compact, full flow assembly that has high resistance to corrosion.

Full line of Fairbanks Solder End Threadless Valves—Globes, Gates and Checks—have an unusually wide application range.

F
FAIRBANKS
BRONZE VALVES
IRON VALVES
BALL VALVES
PLUG COCKS
UNIONS
CATALOG 51
THE FAIRBANKS COMPANY

YOURS ON REQUEST:
Fairbanks Valves Catalog, complete with cutaways, details, and specifications describing these Fairbanks Threadless Valves.

THE **Fairbanks** COMPANY
393 LAFAYETTE STREET
NEW YORK 3, N. Y.
BRANCHES:
NEW YORK 3 · BOSTON 10
PITTSBURGH 22 · ROME, GA.

VALVES
TRUCKS
CASTERS
DART & PIC UNIONS

hold
AIR PRESSURES
steady

PERFEX
PRESSURE
ADJUSTMENT
AIR PRESSURE CONTROL

install this new PERFEX

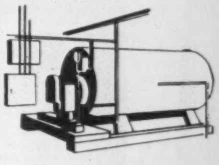
AIR PRESSURE CONTROL

for combustion or air conditioning

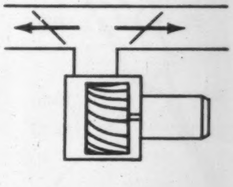
Maintain constant air pressures with this new Perfex Pressure Control, which measures positive air pressures from 0 to .5" water column. Settings may be easily changed by merely turning "Pressure Adjustment" screw to increase or decrease pressures as required. Easily and simply installed; for a wide variety of applications where constant static pressures in chambers or ducts are necessary.

FOR COMBUSTION APPLICATIONS

In oil or gas fired boilers, where the combustion chamber is maintained under a positive pressure, the Perfex Air Pressure Control will maintain the constant combustion chamber pressure necessary for best combustion efficiency at all firing rates.



FOR AIR CONDITIONING APPLICATIONS



The Perfex Pressure Control is a distinct aid in the proper performance of air conditioning systems. The air pressure in ducts can be held constant to provide proper and consistent performance of dampers and grilles.

PERFEX
PERFEX CORPORATION
Executive Offices — Milwaukee, Wis.
Plant — Iron Mt., Michigan
PERFEX CONTROLS LTD. Toronto, Ontario, Canada
AUTOMATIC CONTROLS FOR HEATING • AIR CONDITIONING • APPLIANCES

will continue to serve the company as a consultant on special projects.

▶ *ROBERT E. DePATIE* has been appointed production and procurement manager of *INDUSTRIAL SOUND CONTROL, INC.*

▶ New officers and directors of *REFRIGERATION ENGINEERING, INC.* are *H. T. JARVIS*, president and chairman of the board; *D. D. WILE*, vice president and a director; and *E. V. JARVIS*, secretary-treasurer and a director.

▶ *R. G. NORDSTROM* has been named general manager of the *REFLECTAL CORP.*, a subsidiary of *BORG-WARNER CORP.*

▶ The *AMERICAN HARD RUBBER CO.* has merged its chemical equipment and plastics divisions. *GEORGE H. REED*, formerly manager of the plastics division, heads the combined operations.

▶ Officers elected at a recent annual meeting of shareholders and directors of *NORMAN PRODUCTS CO.* are president and treasurer, *EDWARD A. NORMAN, JR.*; vice president and secretary, *EDWARD A. NORMAN, SR.*; assistant treasurer and assistant secretary, *ROYCE F. EYERMAN.*

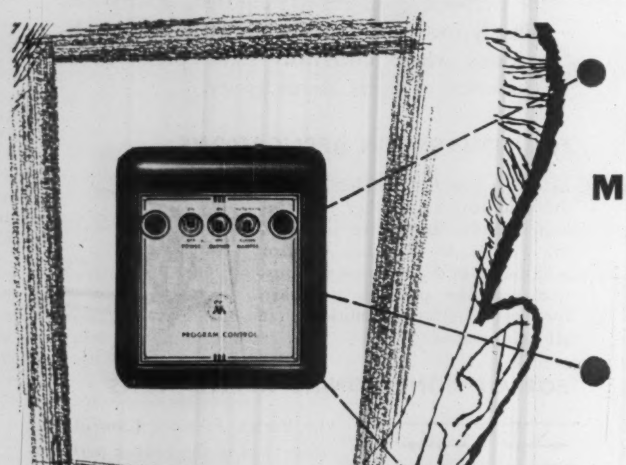
▶ *JUDSON S. SAYRE* has been named president and general manager of the *NORGE DIV.* of *BORG-WARNER CORP.* and a vice president of the parent company.

▶ *ARTHUR T. HUNTER* and *FRED O. PAHMEYER* have been elected vice presidents of *COMBUSTION ENGINEERING, INC.* Mr. Hunter is an executive at the New York sales headquarters and Mr. Pahmeyer is general manager of the St. Louis manufacturing division.

▶ *W. W. FRYMOYER* has been elected a vice president of the *FOXBORO CO.* He will continue his duties as factory manager.

▶ Two new officers of the *ROBERTS-GORDON APPLIANCE CORP.* are *ROBERT I. WARNECKE*, a director who was elected to the position of vice president in charge of engineering, and *WILLIAM E. DAVIS*, who was elected to the board of directors and to the position of vice president in charge of sales.

▶ The non-destructive testing department of *SAM TOUR & CO.* is now headed by *J. K. BELL.* The firm specializes



Like a "magic brain"...

COMBUSTIONEER'S

Modulating Controlled Stokers

SAVE FUEL! SAVE TIME! SAVE MONEY!

Combustioneer's "magic" Modulating Controls level off peaks and valleys in coal feeding, prevent over-firing and waste of coal! They keep more heat in the boiler . . . reduce stack losses . . . use less fuel during "off" periods . . . save operator's time . . . assure smoke-free stacks. They accomplish all this by *automatically* feeding coal and air to the fire at *variable* rates to meet exact load requirements.

Combustioneer Hopper and Bin-Feed Stokers range in capacity from 9 to 1000 lbs. per hour. Their rugged construction gives long life in hard service.

Write today for Architect's Heating Manual containing complete Combustioneer data and specifications.

Combustioneer Division
The Steel Products Engineering Company
1372 W. Columbia St., Springfield, Ohio

Combustioneer

Gas Burners • High and Low Pressure Oil Burners • Oil Furnaces • Stokers • Humidifiers

HEAT-TIMER **GUARANTEED*** Heating Controls and Valves

guaranteed, unconditionally,

TO INCREASE HEATING EFFICIENCY;
REDUCE FUEL COSTS as much as 40%;
MAKE SYSTEMS FULLY AUTOMATIC.

No heating installation is fully automatic without

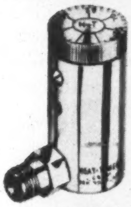
HEAT-TIMER ELECTRONIC CONTROL

Automatically times heat supply to outdoor weather; provides 24-hour electronic precision control; starts and shuts off heat as needed. Saves hours of fuel waste; cuts heating costs as much as 40%.

The Heat-Timer Electronic Outdoor Weatherhead signals temperature changes as slight as 1 degree.

HEAT-TIMER RADIATOR AIR VALVES

solve the heat distribution problems on 1-pipe steam systems.



HEAT-TIMER THERMOVALVE dials for exact temperature desired in any room. Saves fuel in rooms that tend to overheat. No interference with existing controls. Angle or straight shank.

Precision-made: long-life, brass chromeplated; yet cost little more than ordinary radiator air valves.

HEAT-TIMER VARIVALVE gets heat fast to remote radiators, mains and risers. Stops unnecessary overheating and fuel waste. Venting orifice variable 0″ to 5/16″. No hissing, clicking or spitting. Angle or straight shank.

HEAT-TIMER MOTORIZED VALVES

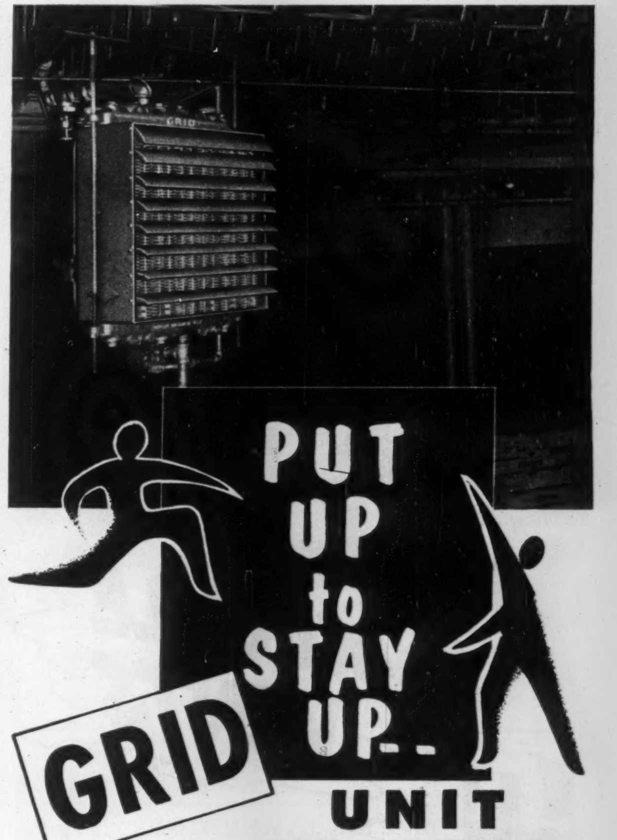
High- or low-pressure, pilot-operated and 3-way. Iron or brass body.

Completely automatic, in sizes to fit any steam main. Used extensively, also, for control of ventilating and air conditioning systems and control of mediums to coils of sprays in processing and other industrial applications. Controls flow of any non-corrosive steam or liquid.

Write for full details on specific products.

HEAT-TIMER CORP'N
657 Broadway, New York 12 - AL 4-5380

Mfrs. of HEAT-TIMER Electronic Controls, Thermovalves, Varivalves, Motorized Valves; Smoke-Eye Smoke Alarm; Fire-Chief Fire Alarm and other outstanding products.



GRID UNIT HEATERS

trouble free service for over 23 years

That's the experience of a large midwest manufacturer. Twenty-three years of service without need for repairs prove to him that, with a GRID installation, first cost is last cost. Such service records (GRID installations made in 1929 are still operating) are the rule rather than the exception with GRID Unit Heaters because GRID was deliberately designed to be a better unit heater. To provide not only ample, comfortable heat, but to give years of service without the usual high maintenance cost generally experienced with ordinary unit heaters.

Such service records occur because GRID is completely different from other unit heaters — here's how:

GRID is an all cast unit with finned heating sections and headers tested to withstand steam pressures up to 250# P.S.I.

GRID construction uses no brazed, soldered, rolled or welded connections between condenser and headers. A specially designed threaded nipple assures a precision, leak-proof fit.

GRID construction has all similar metals in contact with steam, thus preventing electrolytic corrosion which eventually occurs in copper type unit heaters where steam passes from iron pipes into copper cores. (Write for booklet CORROSION IN UNIT HEATERS.)

GRID construction resists corrosion from fumes present in most types of industry.

GRID design incorporating low outlet temperatures, proper fan sizes and motor speeds, assures delivery of warm comfortable air in ample volume to the working level. No stratification of warm air at the ceiling to waste your fuel dollars.

These are the reasons why users of GRID Unit Heaters get 23 years and more of trouble-free service. There are units cheaper than GRID, but there is none better.

You start saving money the day you install GRID Unit Heaters. GET THE COMPLETE GRID STORY — WRITE FOR CATALOG CUH-846-A.

GRID Blast Coils are ideal for process drying — write for Catalog BC-1049.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

D. J. MURRAY MANUFACTURING CO.
Manufacturers Since 1883 • Wausau, Wisconsin

FRESH AIR...ANYWHERE
WITH MUCKLE VENTS
HOSPITALS
SCHOOLS
PUBLIC, CIVIC, BUILDINGS
KITCHENS & LAUNDRIES
FOOD PROCESSING PLANTS

ANY AIR . . . ANYWHERE . . . foul or moist, stale or dry, smoky or gaseous . . . it's up and out quickly with a Muckle Vent. Proven, tested performance of Muckle Vents guarantees superior efficiency on any building, new or old, under any conditions. Architects, designers and builders who compare - specify reliable Muckle Vents.
For greater working efficiency or controlled customer comfort . . . you can depend on Muckle Vents. Streamlined, propeller driven, roof mounted . . . motor out of air stream . . . easy to install . . . available in 15 sizes from 254 CFM to 10280 CFM.

MOISTURE IS NO PROBLEM!
Muckle Vents are especially designed for maximum operating efficiency in removing moisture filled air

Write today for FREE information on industry wide application
Muckle
MANUFACTURING COMPANY
OWATONNA 8, MINNESOTA

WHO'S WHAT

Continued

in chemical, mechanical, metallurgical and non-destructive testing.

▶ Three new vice presidents of *WESTINGHOUSE ELECTRIC CORP.* are *WALTER J. MAYTHAM*, of San Francisco, Pacific coast regional manager for the apparatus divisions; *DALE McFEATTERS*, of Pittsburgh, director of information services; and *OTIS O. RAE*, of Atlanta, southeastern regional manager of the apparatus divisions.

E. V. HUGGINS, vice president in charge of corporate affairs, has also been named secretary of the corporation, succeeding *C. W. POMEROY*, who is retiring.

▶ *DR. WILLIAM ALFRED LaLANDE, JR.* has been elected a vice president of the *PENNSYLVANIA SALT MFG. CO.* and will continue his duties as manager of research and development. *EDWARD F. BEALE*, also named a vice president, is treasurer of the company.

▶ *PETER B. COLWIN* has been named assistant to *CHESTER S. STACKPOLE*, general sales manager of the *UNION ASBESTOS & RUBBER CO.'s* heating and cooling division. He will assist in developing the newly organized international sales organization.

▶ *JOSEPH J. FRIEDLER, JR.* now is vice president in charge of sales for *ILG ELECTRIC VENTILATING CO.* He has been a director of the company and southern district manager in New Orleans.

▶ *GLEN A. WHITE* has joined the engineering staff of *BRYANT HEATER DIV., AFFILIATED GAS EQUIPMENT, INC.*

▶ *JAMES K. PICKARD* has opened a consulting practice in atomic energy developments following his recent resignation from the Atomic Energy Commission. He has set up his office in Washington, D. C. as successor to *FREDERICK H. WARREN*, who has joined the *GENERAL DYNAMICS CORP.*

The field in which Mr. Pickard will work includes the effect of atomic energy developments on different types of business, and opportunities for business created by atomic energy, with emphasis on nuclear power.

IN THE TERRITORIES . . .

▶ For *MAID-O'-MIST, INC—R. C. SCHNEIDER CO.* is the new representative for Minnesota, North and South Dakota.

▶ For *STERLING ELECTRIC MOTORS, INC.*—New distributors are *H. H. HALL MOTOR SHOP*, 103 Pine St., Okanogan, Wash.; *H. B. GUILDFORD & CO.*, 80 Pulaski St., Torrington, Conn.; *GENERAL ENGINEERING CO.*,

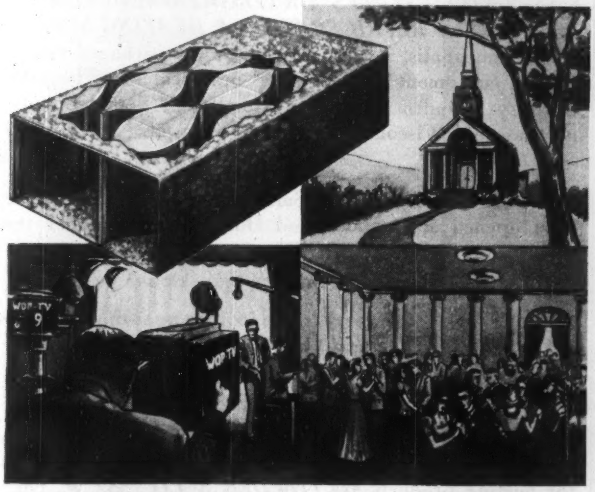
WHERE SILENCE IS AS IMPORTANT AS AIR CONDITIONING

specify *Aircoustat*

*Whatever the location of your next air conditioning installation . . . ballroom, TV studio, church, hospital, office building, store or plant . . . if **quiet** is required, Aircoustat offers the practical, economical solution to air conditioning noise!*

*This compact, **packaged** unit for silencing air and fan noise is easy to install. Incorporated as part of the duct work, it is attached by flexible connections . . . requires no special tools for installing.*

*Aircoustat produces **amazing** results. One **7 foot** unit, for example, reduces the noise level below what **100 feet** of old fashioned duct lining could accomplish . . . with low pressure drop. And selection is no problem. Aircoustat is so engineered that if it fits geometrically, it fits acoustically.*



Constructed of galvanized steel or aluminum, Aircoustats are available in 11 standard sizes for use with all styles and sizes of ducts, and in 3 types to meet any desired conditions.

Write today for free descriptive literature.

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

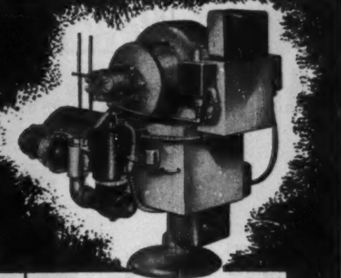
Now! A DUAL FUEL BURNER

Engineered To Insure Peak Efficiency With Both Fuels

GAS and OIL

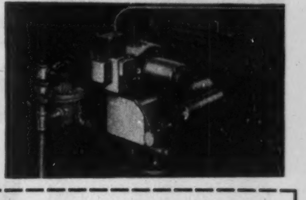
Siemon Power Combi-Matic Burner
employs the forced-draft principle
for firing on both gas and oil.

SIEMON
Bonus Built* Burners
offer more to you . .
more to your customers.



*Bonus Built Features...	Give You These Advantages
Factory Assembled	Less installation time required.
Factory Tested—for Both Gas and Oil	Insures top "on the job" performance.
Automatic Air Adjustment	Just set it . . . forget it . . .
Motorized Gas Valve	Quiet start-ups; actuates air dampers to correct position.
Automatic Ignition Transformer	Automatic ignition for BOTH fuels.
Uses Standard Controls	Parts always accessible immediately.
Electronic safeguard	Immediate response to flame interruption.
Pressure Safety Control	Prevents opening of either fuel valve unless fan is running and pump pressure proven.
Optional Automatic or Manual Changeover	Will switch automatically from outside temperature or by the flip of a switch.

Model FGO-2200-E
Boiler fired at 2,000,000 B.T.U. input—gas and oil installation in a large Midwestern paper distributing plant



Siemon
Power Combi-Matic
DUAL FUEL BURNERS

Siemon Manufacturing Co.
1819 Holmes, Dept. H Kansas City, Mo.
Please rush literature and "profit plan" details about your Forced Draft Dual Fuel Burner.

Name____________________
Company____________________
Address____________________
City__________Zone_____State__________

REGISTERS
GRILLES
SCOOPS
by Stewart
DH
DV
DDHL
DDVL

when in the dark... Look to Stewart for Outstanding New Advances in Air Conditioning Outlets

In this Complete Catalog... For Quality, Originality, Economy and Fast Delivery—your best choice is Stewart for Industrial and Commercial Registers — Grilles and Air Controls. You'll find one to suit your every need in the new 28 page Catalog #53.

SCOOPMASTER
Eliminates sheet metal collar—directs and controls air

SINGLE BANK OUTLET

Triple Bank Registers Individually Adjustable Fins

PLAIN LATTICE GRILLES

SCOOPTROL
Deflects and controls the air from a supply duct into a collar

Opposed-Action Valves
optional with all Supply and Return Air Registers.

Stewart MANUFACTURING CO., INC.
Grove Ave., Essex County, Cedar Grove, N. J.

2241

Representatives in the Principal Cities of United States, Canada and the West Indies.

WHO'S WHAT

Continued

339 Park St., Jacksonville, Fla.; *CONNELL MFG. & ELECTRIC CO.*, 905 Illinois Ave., Aurora, Ill.; *ALAN E. BODYCOMBE & ASSOCIATES*, 18401 Warren St., Detroit 36; *BECKLEAN CO.*, 1316 Oak St., Kansas City, Mo.; *ZELLER ELECTRIC CO.*, 4039 Gravois Ave., St. Louis; *RICKERT ELECTRIC*, 480 Center St., Grayslake, Ill.; *PENINSULAR ARMATURE WORKS*, 151 N.W. 24th St., Miami, Fla.; *PATLYN GEARS & TRANSMISSION CORP.*, 2456 W. 38th St., Chicago.

▶ For *UTILITY APPLIANCE CORP.—THOMAS W. KINDRED* is the new southwestern sales representative.

▶ For *ECLIPSE FUEL ENGINEERING CO.*—District representative for the newly established west coast district office is *CHARLES R. WIRTH*, Industrial Combustion and Furnace Co., P.O. Box 3275, Glendale 1, Calif.

▶ For *SERVEL, INC.—PAUL R. KENNEDY* is now southern regional manager with headquarters in Atlanta, Ga.

▶ For *GENERAL ELECTRIC CO.*, Commercial Products Dept.—*K. G. BATEMAN* is field sales representative for metropolitan New York and northern New Jersey. He succeeds *BERT NATKIN*, now manager of the national accounts sales unit of the commercial products department.

▶ For *UNITED STATES AIR CONDITIONING CORP.*—The *VINCENT REFRIGERATION & HEATING SUPPLY CO.*, Minneapolis, now is distributor for packaged refrigeration equipment and gas fired unit heaters. The sales territory includes Minnesota, North and South Dakota, northwestern Wisconsin and northern Iowa.

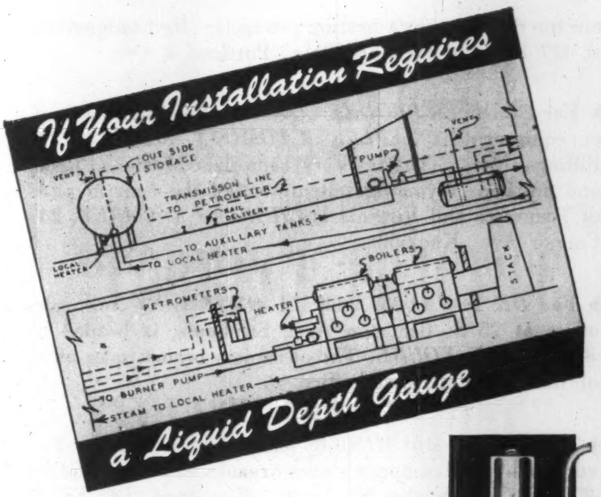
▶ For *A.R.A. MFG. CO.*—Sales and service centers have been opened at Lubbock and Odessa, Texas, under the supervision of *D. A. BROWN*, west Texas division manager.

▶ For *CENTURY ENGINEERING CORP.—M. M. MacKINNON* is district sales manager for the company's New England territory. His home is in Lebanon, N. H.

▶ For *FEDDERS-QUIGAN CORP.*—New representatives for heating products are *LOWDEN & CO.*, 542 W. Lake St., Chicago and *J. H. BALLENGER*, 1284 Bursal Ave., Cincinnati.

▶ For *UNION ASBESTOS & RUBBER CO.*—The *HEATING and COOLING MATERIALS CORP.*, 155 E. 44th St., New York, has been appointed sales representative in the greater New York city area.

▶ For *IRON FIREMAN MFG. CO.—BERT L. DESMOND* is the new district sales manager in the Detroit area.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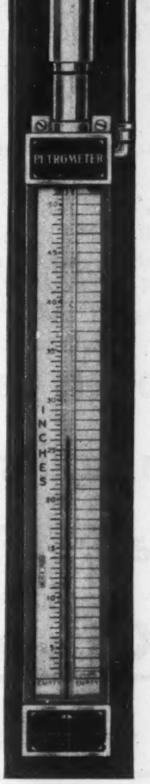
VENT
OUT SIDE STORAGE
TRANSMISSON LINE TO PETROMETER
RAIL DELIVERY
TO AUXILLARY TANKS
TO LOCAL HEATER
LOCAL HEATER
PUMP
VENT
BOILERS
STACK
PETROMETERS
HEATER
TO BURNER PUMP
STEAM TO LOCAL HEATER
a Liquid Depth Gauge

Specify:

PETROMETER

REMOTE READING

TANK GAUGES


PETROMETER
INCHES

THE BEST GAUGE FOR:

Commercial and Industrial Fuel Oil Tanks

Domestic Installations with Buried Tanks

Storage Tanks for other liquids—gasoline, solvents, acids, etc.

Here's Why:

No troublesome moving parts—operates on the sound principle of the U-tube. Simple, dependable and accurate.

Large, easy-to-read vertical scale gives tank contents at a glance. Eliminates the cumbersome measuring stick and the inconvenience of climbing the tank.

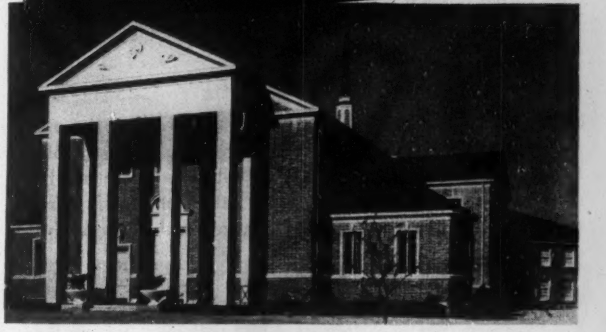
Installation is easy—gauges can be installed on tanks above or below ground level and up to ¼ of a mile away. The tank assembly for the gauge can be installed even when the tank contains liquid. It can also be fitted in the tank separately to complete the tank work. The gauge can be connected any time later. Just tighten one simple connection and the job is finished.

FOR TANKS 20 INCHES TO 50 FEET DEEP. ***Write for Bulletin PV.***

LIQUIDEPTH INDICATORS, INC.

43-22 TENTH ST., LONG ISLAND CITY 1, N. Y.

When the best in *air conditioning* is required, specify *Ice-Cels*



University Park Methodist Church

DALLAS • TEXAS

APPLICATION: Equivalent of five DOLE **ICE-CEL** Units, with two 15 H.P. compressors — combined capacity of 200 ton hours of refrigeration.

LOAD: 80 tons an hour for two and one half hours — in excess of actual requirements, which can be utilized with compressor input for special occasions.

DOLE **ICE-CEL** Units are available for low cost installation in churches, halls, mortuaries, cafeterias, offices and retail stores.

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DOLE REFRIGERATING COMPANY

5918 NORTH PULASKI ROAD, CHICAGO 30, ILL.
103 PARK AVENUE, NEW YORK 17
In Canada: Dole Refrigerating Products, Ltd.
44 Elgin Street, Brantford, Ontario

Maximum Refrigeration Efficiency

DOLE®

MANUFACTURERS OF

THE *Cel* LINE

WALTER C. DUVALL, Salt Lake City, is district sales manager for Utah and southern Idaho.

▶ For *FIELDEN INSTRUMENT DIV., ROBERTSHAW-FULTON CONTROLS CO.*—New manager of the Boston sales office is *LAWRENCE C. CONNOLLY*, who has been a sales engineer in the New England territory for several years.

▶ For *AMERICAN NICKELOID CO.*—New sales office in Philadelphia is in the Western Saving Fund Bldg., Broad and Chestnut Sts. The Detroit sales office has been closed and *MARC F. HERMANN*, the company's former representative there, now is in charge of the Philadelphia office.

▶ For *TUBULAR PRODUCTS DIV., BABCOCK & WILCOX CO.*—*HENRY W. DOCTOR* is in charge of the new district sales office at 2330 Victory Parkway, Cincinnati. The territory includes southern Ohio, southern Indiana, Kentucky, Tennessee, Alabama, Georgia, South Carolina, North Carolina and Florida.

▶ For the *NATIONAL RADIATOR CO.*—*BERT W. FARNES* is now covering Oregon and southern Washington for the company's heating products. He headquarters at 317 Builders Exchange Bldg., Portland 4, Ore.

▶ For *CLEAVER-BROOKS CO.*—Representative for boiler equipment is *LEFLER WYOMONT SUPPLY CO.*, Billings, Mont. The territory comprises Montana, Idaho and northern Wyoming. Representing the firm in parts of Tennessee and Virginia is *CHARLES R. CAREY*, 247 Connor Ave., Knoxville.

▶ For *DE LAVAL STEAM TURBINE CO.*—New sales office at 25 S. Bemiston Ave., St. Louis, is headed by *WILLIAM F. YOUNG*. The office is a branch sales office of the Chicago district office.

▶ For *BOHN ALUMINUM and BRASS CORP.*—Two additions to the company's sales organization are *EUGENE WORELL*, with the St. Louis office, and *JAMES R. FLEMING* at the Dayton, Ohio office.

▶ The *POWERS REGULATOR CO.* has completed new office buildings for the western division in Los Angeles and for the Boston area.

▶ For *ILG ELECTRIC VENTILATING CO.*—*J. H. MALONEY*, formerly manager of the St. Louis branch office, has been named manager at New Orleans, and *R. H. HOLTGREWE* has been appointed St. Louis manager. *CARL E. BROCK, JR.*, formerly manager of the

Thousands of Satisfied Customers have dependable *Yula* protection against damaging *Fuel Oil Pre-heater LEAKS*

with the New Improved **YULA-TROL** Fuel Oil Detector

and **YULA "YT"** "U" Tube Fuel Oil Heater

Approved by the New York City Board of Standards and Appeals. No. 367-50 S.A.

Patent No. 2,610,267

A.S.M.E. CONSTRUCTION

IMPORTANT

Yula Water Heaters, Inc., was the first to produce this type of probe heater which was developed in its factory. Yula Water Heaters, Inc., and its Licensees have the sole right to manufacture and sell probe heaters under letters patent No. 2,610,267 and all other probe heaters of this type, unless licensed by Yula Water Heaters, Inc., are spurious and infrigement of the said letters patent.

The *Yula-trol* is connected with a probe in the shell of the Fuel Oil Pre-heater. If water is displaced from contact with the probe by oil or air, the Yula-trol instantly shuts off heating unit. Sounds alarm.

The new, improved *Yula* "YT" "U" Tube Heater precludes possibilities of Air Pockets. It is designed to pre-heat No. 6 (Bunker C) fuel oil efficiently and economically by use of hot water as the heating medium.

For Complete Information write . . . . . DEPT. HP

YULA WATER HEATERS, INC.

166 WEST 225th STREET, NEW YORK 63, NEW YORK

MEMBER FUEL OIL AND WATER HEATER MANUFACTURERS ASSOCIATION

Send for This Useful Reprint Volume

"CORRECT PRACTICE *in* INDUSTRIAL PIPING"

— All-New Second Edition —

196 Pages — 8½" x 11" — $1.50

This practical book is made up of outstanding papers and data on industrial piping selected from past issues of "Heating, Piping & Air Conditioning." It is a most comprehensive collection of case studies, showing how various difficult piping problems encountered in different industrial plants were successfully worked out by piping experts.

Design, installation, operation, and maintenance . . . steam, air, gas, oil, process, water and refrigeration piping . . . piping in pulp and paper and steel mills, in automobile plants and breweries, in the food and chemical and textile industries, and in many other types of manufacturing plants are dealt with from many different angles.

Send $1.50 today for this book to the address below.

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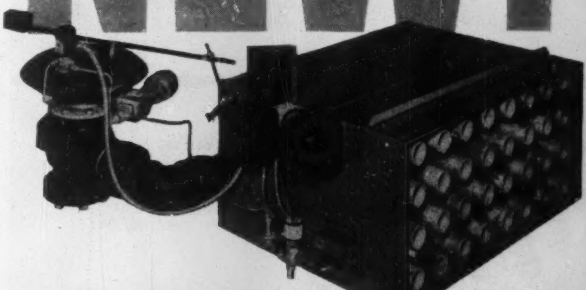
NEW!



MULTURI
(Multiple Venturi)
GAS BURNER

Especially designed for . . .

HARD-TO-FIRE
- **SCOTCH MARINE BOILERS**

HARD-TO-FIRE
- **STEEL FIRE BOX BOILERS**

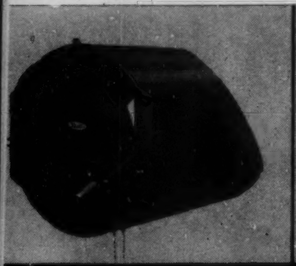
AT HIGH FIRING RATES AT HIGH EFFICIENCY!

A Premix Type Gas Burner, ideal for commercial and industrial size boilers and warm air furnaces. Gives maximum performance from hard-to-fire Scotch Marine and steel fire box boilers. Flame characteristics make the burner a natural for units with extensive refractory surface. Suitable for any gas at 4" gas pressure or more. Permits high firing rates at high efficiency. Simple to install, adjust, and operate. Completely Factory Wired and Assembled . . .
Ready for Immediate Installation !

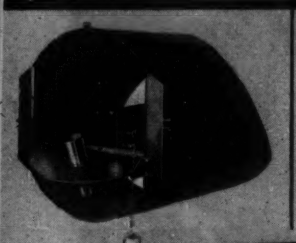
MULTURI BURNERS are available in standard modular units of 6 to 54 mixers. Capacities from 1,200,000 to 10,800,000 BTU/hr. Special units of higher capacities can be furnished. *Write or phone us for detailed information.*

Also Available — Nordensson Power Burners and Combination Gas-Oil Burners.

ROBERTS-GORDON APPLIANCE CORP.
DEPARTMENT HPAC • BUFFALO 6, N. Y.
Conversion Gas Burners • Gas Heating Equipment



DOWN-DRAFT VIEW
Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.



UP-DRAFT VIEW
Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.

field

"MG" Draft Controls
ENGINEERED SPECIFICALLY FOR

GAS
fired industrial and commercial plants

1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provides simple adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
5. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases — resulting in greatly increased life.

The Field "MG" has met the most rigid municipal requirements for commercial and industrial installations. It is being used with full approval of the nation's leading gas companies in the nation's largest cities. Fully safe, fully proven, it provides for gas-fired installations the same accurate, dependable performance, the fuel economy so long provided by Field Draft Controls for oil and coal fired furnaces. Write for complete information.

FIELD CONTROL DIVISION
of H. D. Conkey & Company — Mendota, Illinois
AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division — Cranes, Hoists

Cleveland branch office, has been appointed middle Atlantic district manager in Philadelphia. *CARL W. DEGLER, JR.*, formerly of the Philadelphia office, now is manager of the Cleveland office. *FOLGER H. BIGELOW*, who has been manager of the Atlanta branch office, has been named southeastern district manager.

▶ For *SWARTWOUT CO.*—A company-operated sales and service office for the Ventilator Div. has been opened at 547 Swede St., Norristown, Pa. with *GEORGE BARNES, JR.* as sales manager in charge of the Philadelphia district. In Portland, Ore., the *W. H. CRESS CO.* now is handling sales and service for the company's Roof Ventilator Div. in Oregon and parts of Washington. The *I. RUSSELL BERKNESS CO.*, 615 E. Franklin St., Richmond, is the new representative for power plant and "Autronic" process control equipment for the greater part of Virginia. Campbell King, Jr. continues to represent the firm in the western portion of the state. In San Francisco a district office has been opened at 551 Minna St. *ROGER C. ANTHONY*, formerly of the company's New York sales office, is manager.

▶ For *PETRO*—*J. HENRY CHAPMAN* of *CHAPMAN-DUVALL, INC.*, Salt Lake City, now is district sales representative and will work with distributors in Utah and southern Idaho.

▶ For *WORTHINGTON CORP.*—The twin cities district office is now at 807 Thirteenth Ave., South, Minneapolis.

▶ For *IRON FIREMAN MFG. CO.*—*ALBERT G. PIECE*, Warwick, R.I., is a new field engineer in New England; *JOHN E. GRIFFITH* is district sales manager in Virginia; *RICHARD W. BRENNEKE* is manager of the Portland, Ore. sales and service branch.

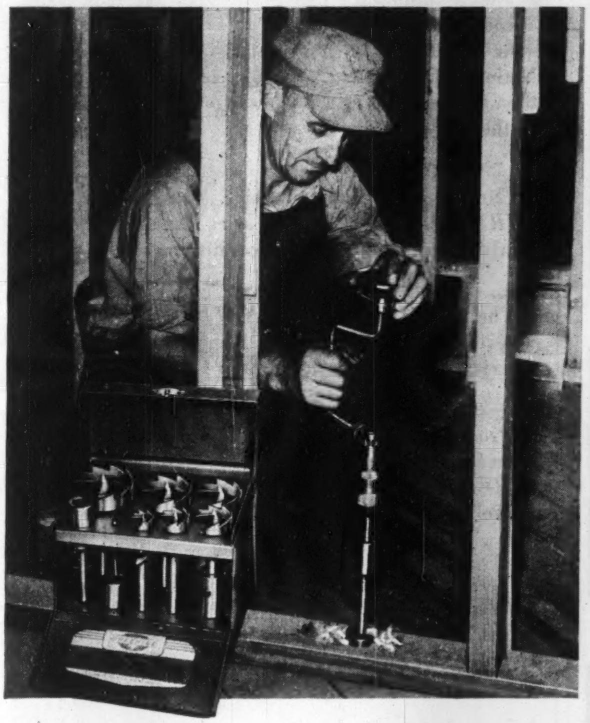
▶ For *WAGNER ELECTRIC CORP.*—The Atlanta branch offices and warehouse have been moved to 1536 Boulevard Ave., N.E.

▶ For *WOLVERINE TUBE DIV., CALUMET & HECLA, INC.*—A new mill depot is being opened in Columbus, Ohio, to serve Ohio, Pennsylvania, Indiana and parts of Kentucky. The division also has appointed *R. E. ENGEL* as sales representative in the Oklahoma-Kansas area, with headquarters at 304-A Daniel Bldg., Tulsa.

▶ For *BUSH MFG. CO.* and *HEAT-X-CHANGER CO.*—New sales engineer for the Pittsburgh area is *JOSEPH HERRMANN.*

▶ For *BINKS MFG. CO.*—The *McCOMBS SUPPLY CO.* is cooling tower representative for Colorado, the northern half of New Mexico, the southern half of Wyoming and the extreme western counties of Nebraska and Kansas. Offices are at 1819 Wazee St., Denver.

SPEED AND SIMPLIFY BORING
OF PIPE-SIZE HOLES IN WOOD
WITH GREENLEE PIPE BIT SET

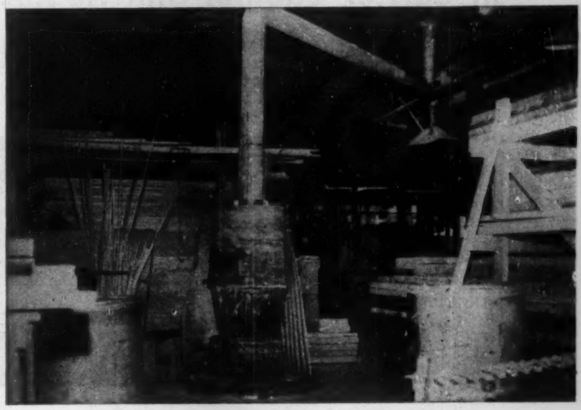


Designed especially for plumbers, steamfitters and electricians to provide fast, easy boring of accurate holes in wood for ½″ to 2″ pipe and conduit. Makes swift, easy work of an otherwise tedious, hard job . . . assures clean "tailor made" openings for a neat job. The set is furnished in a sturdy, attractive metal box with convenient carrying handle. Bits have ½″ shanks for use in portable electric or pneumatic drills and in stationary boring machines. An adaptor is provided for standard auger bit braces. Adaptors are also furnished for using standard ⅜″ pipe as an extension for deeper boring and longer reach. Get facts today on these timesaving GREENLEE tools.

TOOLS FOR CRAFTSMEN
GREENLEE

Greenlee timesaving tools for plumbing and heating work . . . Hydraulic Pipe Benders • Tubing Benders • Hydraulic Pipe Pushers • Pipe Bits • Auger Bits • Spiral Screwdrivers • Chisles and Many More. Write for details. Greenlee Tool Co., 2347 Twelfth Street, Rockford, Illinois.

DRAVO HEATERS
do it again!



BEFORE—Overhead Door Company of Penna., Inc. depended on "stoves" to heat the work area in its Lewistown, Penna. plant. These "stoves" did a poor heating job and required constant attention.

AFTER—Dravo *Paraflo* Heaters and a Dravo *Counterflo* Heater do a real comfort heating job . . . help reduce fire insurance premiums 25% . . . increase working space 10% . . . eliminate 24-hour-day, 7-day-week watchman service . . . operate automatically eliminating the need for attendants. This new heating system also provided much better working conditions for employees.

Mail this coupon for complete information on Dravo Heaters.

DRAVO CORPORATION, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.

DRAVO

Please send me complete information about the Dravo:

☐ *Counterflo Space Heater* ☐ *Paraflo Space Heater*
☐ *Gas Fired Unit Heater*

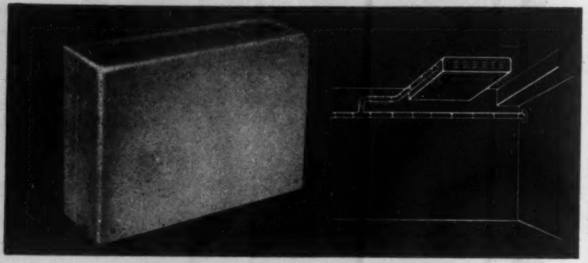
☐ Please have a representative call at no obligation to me. Ask for Bulletin FG 598-5768.

Name__________ Title__________
Company__________
Address__________
City__________ Zone_____ State_____

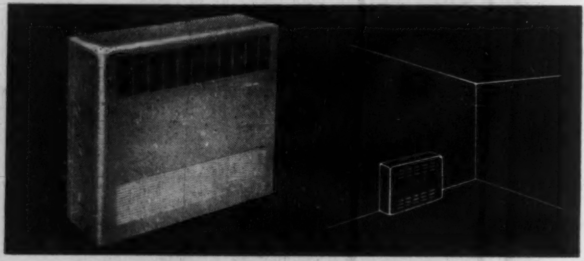
It's Triplets!

—in Carrier Cabinet Unit Heaters

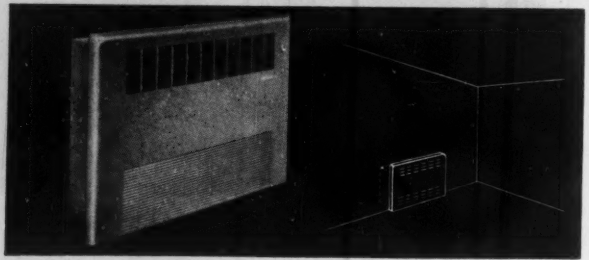
FOR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL HARD-TO-HEAT SPACES



Steam or hot water. 3 models in 3 sizes



32,000 to 115,000 Btu per hour (basic rating)



Carrier announces the arrival of an addition to its line of Unit Heaters for commercial buildings, auditoriums, recreation halls, public schools and similar buildings having lobby, vestibule or special space heating problems. Here are big-capacity Cabinet Unit Heaters offering gently fan-propelled heat output. Construction, operating and control features are many. Efficient performance and long life are Carrier-assured.

Carrier Cabinet Unit Heaters are designed for ceiling-mounted, wall-hung, inverted wall-hung, wall-recessed or floor installation. For full information WRITE to Carrier Corporation, Syracuse, New York.

Jobbers and Distributors—Ask us also about a Carrier extra-profit protected franchise.

Carrier

AIR CONDITIONING
REFRIGERATION
INDUSTRIAL HEATING

WE HEAR THAT . . .

▶ Plans to build a large new plant at Danville, Ill. to produce "Genetron" refrigerants and aerosol dispersants have been announced by the *GENERAL CHEMICAL DIV.* of Allied Chemical & Dye Corp. A new addition to the division's Baton Rouge, La. works is also underway.

▶ The 3 millionth "Universal" fuel oil tank gage, produced by the *ROCHESTER MFG. CO.*, was plated with gold in celebration of the occasion and displayed at the National Oil Heat Exposition in Philadelphia. It was then shipped out in a plain carton along with other gages of the same model.

▶ Climaxing a company-wide sales drive, seven of *CHRYSLER AIRTEMP's* sales managers have been awarded fully-equipped air conditioned cars.

▶ The 60th birthday of the *NATIONAL RADIATOR CO.* was observed recently. The firm was founded in 1894 at Norristown, Pa., as the Fowler Radiator and Mfg. Co.

▶ Production of heavy-duty water chillers, already increased over last year's rate, has now been doubled by *SERVEL, INC.*, according to H. R. Nielsen, manager of Servel's air conditioning division.

▶ Two regional sales conferences held by *PENN CONTROLS, INC.*, were devoted to new products and product information, new market developments and other subjects essential to effective selling.

▶ Two high school students were winners of *DRAVO CORP.'s* engineering awards at the 15th annual school science fair in Pittsburgh. One student exhibited a model showing the principles of air conditioning.

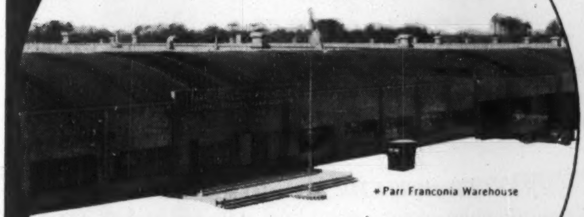
▶ A small, circular blue and white label, inscribed with the initials CMA, has been adopted by the *CONVECTOR MANUFACTURERS ASSOCIATION* for the use of its members. It signifies convector ratings approved officially under Commercial Standard 140-47.

▶ A 1954 calendar was used by *AMERICAN AIR FILTER* to present a financial statement to employees. The "Dollar Diary" translated each item of the 1953 operating statement into days of work.

▶ A group of employees has purchased *BARNES and REINECKE, INC.*, Chicago design, research and development engineering firm. *THOMAS W. ALDER* continues as president.

▶ The *J. O. ROSS ENGINEERING CORP.* is enlarging its department for manufacturing high pressure hot water systems for industrial heating. *ERWIN G. HANSEN,*

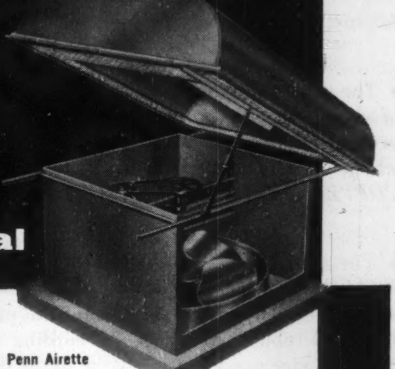
this "mile-long" * warehouse



depends upon

PENN VENTILATORS

for quiet, steady air removal



Penn Airette

. . . performance plus appearance . . . make Penn Airettes a popular partner on many important projects. These self-contained propeller fan roof ventilators come on the job as a complete package — ready for installation. They feature clean contours, substantial weatherproof housings, Direct or V-Belt Drives, Capacities from 400 to 40,000 cfm.

Your Penn Ventilator man will be glad to show you more about this exhauster or any of the other products in Penn's complete line of powered and gravity roof ventilators.

Complete Literature Available Write to Engineering Department

PENN VENTILATOR COMPANY

Representatives and Distributors in principal cities

PHILADELPHIA 40, PENNA.

FOR MORE THAN 25 YEARS THE BUILDERS' roof TOP LINE

BRIEFS

from The YEOMANS GUARD

Another veteran SHONE speaks up! "We never wear out!"

Back in 1891 a duplex unit of Shone* Pneumatic Ejectors was installed in the new Monadnock Block, then the world's largest office building. Come 1906 it was decided that this was a one-pump job, so one of the twins was unhitched, stored, and later returned to the factory for overhaul.

In 1911, weary of idleness, that same Shone was installed in the new Monroe Building nearing completion; and found itself alongside a new Yeomans vertical wet-pit centrifugal drainage pump.

1954 finds these two Yeomans units operating as efficiently as the day they were installed. "Ordinarily," says Chief Engineer John Kowalski, "we use the centrifugal, and test the Shone every week." It's a stand-by unit, fully able to handle the job should anything happen to the 43-year-old youngster. Neither unit has required any attention, other than normal maintenance, since Mr. Kowalski has been in charge.

Can't you hear that Shone saying "we never wear out!"

If you're interested in equipment that gives every indication of being indestructible, call your Yoemans representative. Keep in mind, too, that Yeomans recommendations are unbiased — Yeomans builds both centrifugals and ejectors: none better.

☐ Please send Shone literature
☐ Please send Bulletin 3-8000 on Yeomans Vertical Centrifugal Pump

Yeomans Pumps are BETTER because of LUBRI-VAC*

There are a good many vertical centrifugal pumps on the market — no secret about building one; and the fact is that most of them are good pumps. But the pay-off is this: *How long will a pump keep on operating before its main bearing has to be replaced?*

Here's a solid, dependable fact you can take hold of:

- A Yeomans vertical wet pit centrifugal will stay on the job longer, *without bearing failure,* than any similar pump you can name — *because it is equipped with Yeomans Lubri-Vac.*

Lubri-Vac is a system of lubrication, developed by Yeomans engineers, that *keeps the main bearing properly lubricated.*

Field data on hundreds of pump installations prove conclusively that Lubri-Vac has reduced bearing failures by an impressive 95 per cent!

There are two models of Yeomans Vertical Wet Pit Centrifugal Pumps:

- Series 3000 — Heavy Duty Bilge Pump
- Series 8000 — Screenless Ejector

Each is unique in this respect: it has the advantage of Lubri-Vac Step 1 toward putting an end to pump troubles and failures is to send for

☐ Bulletin 3-8000

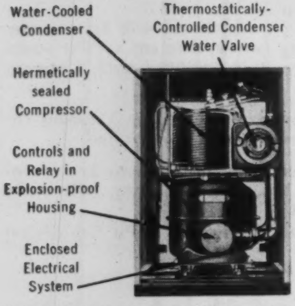
*A Yeomans Trade Name

YEOMANS BROTHERS COMPANY

2000-5 N. Ruby St., Melrose Park (Chicago), Illinois

EXPAND YOUR SALES WITH . . .

Explosion Proof!
TEMPRITE
WATER COOLERS
FOR...
Grain Processing Plants
Textile Mills
Wood Working Plants
Hospital-Surgical Rooms
FOR...
Chemical Plants
Refineries
Paint Plants
Collieries
Temprite
The Cooler with the DEEP Stainless Top!


Water-Cooled Condenser
Thermostatically-Controlled Condenser Water Valve
Hermetically sealed Compressor
Controls and Relay in Explosion-proof Housing
Enclosed Electrical System

Temprite explosion-proof water coolers are *essential* in a long list of potentially combustible factory atmospheres. Invariably these dangerous atmospheres also contribute to thirst with coal dust, grain dust or wood dust floating in suspension. Underwriters' approved for Class I, groups C and D; Class II, groups F and G; and Class III of the NEMA Code. Write now for details.

Temprite Products Corporation
P. O. Box 72-L, East Maple Rd., Birmingham, Michigan
Send me distributor franchise information, I am interested in handling Temprite Water Coolers.
Name____________________
Address____________________
City__________ State__________

WE HEAR THAT

Continued

formerly with the French Caliqua Co., Paris, has joined the organization as a sales engineer. New enlarged quarters have been opened at 444 Madison Ave., New York.

▶ District sales managers' conferences were held recently in five of *WORTHINGTON CORP.'s* plant cities. Shop tours, sales problem discussions and new product exhibitions were featured.

▶ *CHRYSLER AIRTEMP* has established 15 new air conditioning compressor rebuilding stations in key service areas, equipped to repair compressors using factory approved standards. Depending on available stock, the station will either replace or repair a returned compressor.

▶ A scholarship program to assist students interested in the technical sciences has been announced by the *OHIO BRASS FOUNDATION*, a nonprofit organization established by the Ohio Brass Co.

▶ *REFRIGERATION ENGINEERING, INC.* of Los Angeles has established new warehouse facilities in Philadelphia and St. Louis.

▶ The copper and brass mill industry, with the cooperation of copper mining companies, has instituted a more comprehensive research and promotion program, details of which were announced at a recent annual meeting of the *COPPER & BRASS RESEARCH ASSOCIATION*.

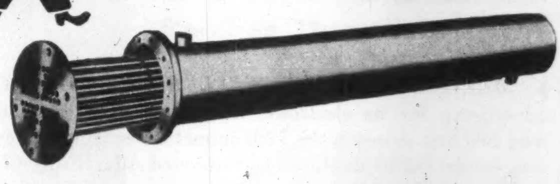
▶ The *TUBULAR PRODUCTS DIV.* of *BABCOCK & WILCOX CO.* has completed an expansion program which will increase by nearly 40 percent the production of stainless steel tubular products. According to *E. A. LIVINGSTONE*, vice president in charge of the division, technological progress in the atomic energy, aircraft and boiler industries has increased the need for stainless tubing.

▶ *CORY CORP.* has announced the organization of a new Contract Sales Div. to promote the sales of "Fresh'nd-Aire" air conditioners to the commercial and institutional field. *FRANK POWER*, sales manager, working in conjunction with *ROBERT TenEYCK*, field sales specialist, heads the division.

▶ An annual four-year scholarship for the sons of employees of the *ELECTRO DYNAMIC MOTOR GENERATOR DIV.* and the *ELECTRIC BOAT DIV.* of the General Dynamics Corp., will be offered this fall. Also eligible are young men who graduated no more than two years ago and are employed at either of the two divisions.

▶ *S. R. BAKER*, chairman of the board and president of the *PYRENE MFG. CO.* and its wholly owned affiliate, the *C-O TWO FIRE EQUIPMENT CO.*, has announced the

Look inside a *Taco* HEAT EXCHANGER



You'll see why you get better performance . . .

- Electronically rolled, expanded joints . . . permanently leakproof.
- Tubing held rigidly apart by separators . . . no rubbing, no noise, no wear.
- Baffling engineered for rapid heat transfer . . . maximum operating efficiency.
- Head passes designed for free flow . . . minimum pressure drop.

Taco HEAT EXCHANGERS

. . . engineered to fill *your* requirements

Taco Field Engineers have the experience and technical "know-how" to help you select exactly the right Heat Exchanger for conditions to be met: flow, velocity, temperature rise, log mean temperature difference, pressure drop, transmission rate, and steam pressure or temperatures of other heating media.

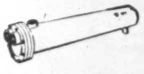
For complete information, write for "Taco Heaters" catalog containing Taco's "pin-point" Selection Charts.

Taco

Circulating Pumps

TACO HEATERS, INCORPORATED
1160 Cranston Street
Cranston 9, R. I.

Tank Heating Units



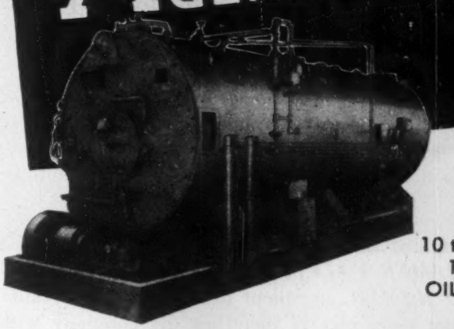
Chillers

Condensate Coolers
Converters
Fuel Oil Heaters
Oil Coolers
Radiation Heaters
Water Heaters

REAL SAVINGS

in installation . . . in operation with these "PACKAGED" BOILERS

AMESTEAM GENERATOR



20 SIZES
10 to 600 h.p.
15 to 200#
OIL OR GAS

●

JUST SET IT ON YOUR CONCRETE FLOOR — no special foundation or heavy stack are needed. You make BIG savings on installation of AMESTEAM GENERATOR because it's a complete, self-contained unit, ready to start generating steam!

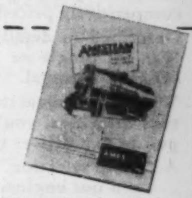
FULLY AUTOMATIC . . . TROUBLE-FREE! Set it and forget it. No more continual dirt, dust and ashes. Models for oil or for gas, or combination units for either fuel.

EASY TO CLEAN! EASY TO GET AT! Davit-hinged doors at rear give quick access to furnace and all tubes — and look at the space under the shell!

COMPLETE SERVICE! Our LOCAL service man starts your unit and gives you three months' FREE service.

Write for FREE bulletin TODAY!

AMES IRON WORKS
Box D-74, Oswego, N.Y.
Gentlemen:
Please send me further information on AMESTEAM GENERATORS and name of nearest representative.



NAME..
COMPANY...
ADDRESS...

AMES IRON WORKS INC.

BOX D-74 **OSWEGO, N. Y.**

election of the directors and officers to serve for both companies during the ensuing year. In addition to Mr. Baker, officers include *F. B. ALLEN, M. A. LASWELL, LOUIS LEVINE* and *A. F. RATZER* as vice presidents; *B. S. McCABE*, secretary; and *J. R. ZELENKA*, assistant treasurer and secretary.

▶ The *R-B-M DIV., ESSEX WIRE CORP.*, recently completed an additional 31,000 sq ft of space for manufacturing purposes.

▶ During May and June, the *IRON FIREMAN MFG. CO.* conducted a series of district meetings in 14 cities throughout the country. The meetings were part of a program to provide dealers and their sales and engineering staffs with up to date information on the latest equipment.

▶ The board of directors of *AIR REDUCTION CO., INC.*, has approved the acquisition of the Colton Chemical Co., subject to the approval of the stockholders of Colton.

▶ A change of the company name from Hamer Oil Tool Co. to *HAMER VALVES, INC.* has been announced by *LELAND HAMER*, president of the firm, who said that the change more clearly identifies the company with its products.

▶ *DU PONT* has established a market analysis section for its *KINETIC CHEMICALS DIV.* with *JOSEPH C. HOOPES* as manager.

▶ The *OTTO BERNZ CO., INC.* has announced that its "Bernz-O-Matic" self contained propane gas torch has been listed by Underwriters Laboratories, Inc.

▶ Seven one-week air conditioning schools for all field personnel are being held in Detroit by *U. S. RADIATOR CORP.* The faculty is headed by *LORIN G. MILLER*, former dean of the School of Engineering at Michigan State College.

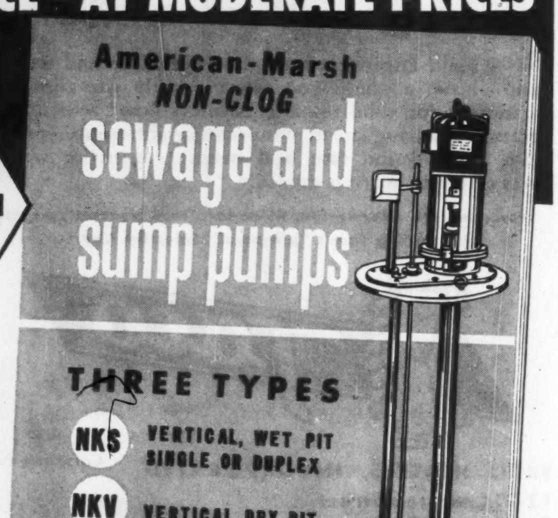
▶ *MINNEAPOLIS-HONEYWELL REGULATOR CO.'s* advertising for its electronic temperature control system won two first prizes in the 12th annual advertising competition conducted by the Chicago Federated Advertising Club. Foote, Cone & Belding, Chicago, is the company's advertising agency.

▶ *AMERICAN AIR FILTER CO., INC.* has purchased the entire plant and equipment of Ice Cooling Appliance Corp. in Morrison, Ill. The plant will be operated by the firm's *HERMAN NELSON DIV.*

▶ The *WESTINGHOUSE ELECTRIC CORP.* has announced plans to expand its Small Motor Div. operation

GET NON-CLOG PERFORMANCE—AT MODERATE PRICES with AMERICAN-MARSH SEWAGE AND SUMP PUMPS

WRITE FOR YOUR COPY OF THIS NEW BULLETIN



In this brand-new bulletin, you'll find full data on the high efficiency—and non-clog design—of American-Marsh Sewage and Sump Pumps. Despite many superior construction features, they're competitively priced.

Described in detail are three non-clog types—the NKS Vertical, Wet Pit Single or Duplex; the NKV Vertical, Dry Pit; and the NKH Horizontal.

When you look at the performance tables and examine the construction drawings, you'll see why these top-quality sewage and sump pumps can deliver the trouble-free service you want.

A "pump selection" page will help you choose the model you need . . . and our engineering staff will gladly cooperate too. *INVESTIGATE NOW—WRITE FOR NON-CLOG BULLETIN 325-A.*

AMERICAN-MARSH PUMPS

BATTLE CREEK MICHIGAN

In Canada:
American-Marsh Pumps (Canada) Ltd., Stratford, Ont.

CENTRIFUGAL, TURBINE, STEAM AND POWER PUMPS FOR TESTING, PROCESSING, BOILER FEED, FIRE PROTECTION, ETC

NEW

Improved TOLEDO Simpact

1" to 2" Self-Contained Ratchet Threader

NO
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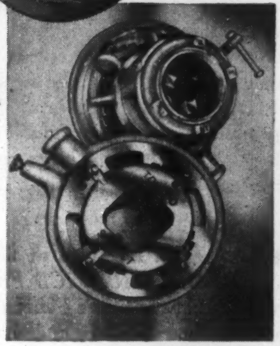
TOLEDO
SIMPACT
TOLE



WITH

CAM-TYPE

PIPE HOLDER

★ *Improved* cam-type quick-action pipe holder has broader jaws for more positive grip on pipe.

★ Free action cam assures instant setting to any size—1" to 2".

★ Easy to center . . . you get perfect aligned threads.

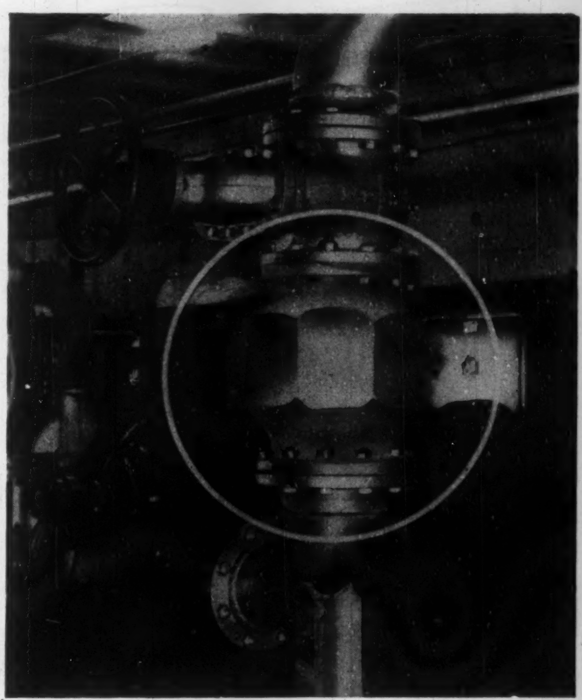
★ Fewer moving parts . . . minimum wear . . . light in weight. Amazingly compact . . . will thread a pipe projecting through a wall as short as 6¼".

★ Accuracy proven through the years . . . dies recede along tapered steps. A fine quality tool—yet low in cost! Write for new catalog. Order through your supply house. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

RELY ON THE LEADER . . . *all the way!*

TOLEDO

PIPE TOOLS..POWER PIPE MACHINES
POWER DRIVES



10" MILLER VALVE INSTALLED IN MIDWESTERN DEPARTMENT STORE

MILLER

NOISELESS — NON-SLAM
CENTER GUIDED CHECK VALVE

SHOCK-PROOF
ELIMINATES WATER HAMMER

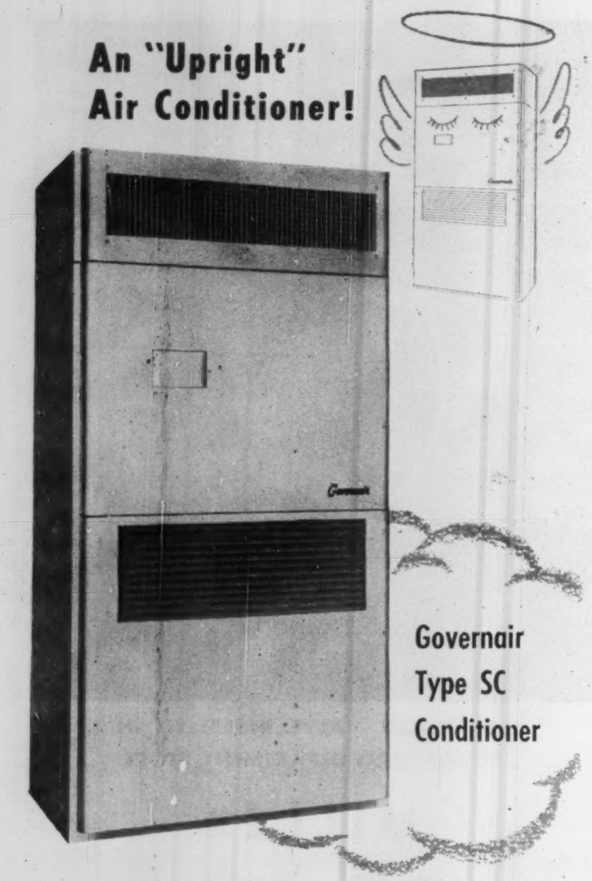
FULL RADIAL FLOW
MINIMUM PRESSURE LOSS
SIZES 1" THROUGH 24" FLANGED
SEMI-STEEL — CAST STEEL — ALLOYS
PRESSURES 125 LBS. TO 2500 LBS.
YOU CAN DEPEND ON A
MILLER CHECK VALVE
IT IS THE BEST

MILLER VALVE CO., INC.
P.O. BOX 1255
PITTSBURGH 30, PENNA.

Please send your Bulletin 153 Descriptive of Miller Shock Proof Center Guided Check Valves.

NAME AND TITLE . . . .
FIRM NAME . . . .
ADDRESS . . . .
CITY . . . .

An "Upright" Air Conditioner!



Governair Type SC Conditioner

Yes, this is an *upright* Governair self-contained conditioner—but that's not the reason for the halo.

The halo is there because this air conditioner behaves itself! Built to perform true air conditioning quietly and efficiently . . . it does just that! Flexibility, compact design, easy installation, dependability and economy are among its many virtues.

Available in capacities from 3 to 15 tons, the Governair Type SC Conditioner is the answer to your air conditioning needs in commerce, institutions, factories and homes. Choose *Governair* . . . originators* of completely packaged air conditioners!

AIR CONDITIONERS
COMPLETELY PACKAGED AIR CONDITIONERS
BLAST COILS FOR HEATING & COOLING
EVAPORATIVE CONDENSERS

GOVERNAIR

*Type SCU Conditioners Patent No. 2,297,928

GOVERNAIR CORPORATION • 513 N. Blackwelder • Oklahoma City, Okla.

WE HEAR THAT

Continued

by constructing a new plant at Upper Sandusky, Ohio. The new plant will produce smaller sizes of fractional horsepower motors.

▶ The Syracuse, N.Y. facilities of *CARRIER CORP.* will be improved and rearranged in order to make possible a 75 percent increase in the production of room air conditioners.

▶ *H. K. PORTER CO., INC.* has acquired the Pioneer Rubber Mills Inc. of Pittsburg, Calif. The firm will become part of the Quaker Rubber Corp., one of Porter's nine divisions.

▶ *VAPOR HEATING CORP.* recently held an open house to celebrate completion of its new $2 million plant in Niles, Ill., a suburb of Chicago. Office facilities are completely air conditioned. To heat the plant, the company uses steam from its steam generators which are tested before shipment.

▶ A hydraulic test laboratory, said to be one of the world's largest and most complete, has been placed in operation at the Harrison works of *WORTHINGTON CORP.* The laboratory which covers over 20,000 sq ft, took three years to plan and build. Designed basically for production or performance testing, the laboratory will be used for applied research and development of fluid handling machinery. Officials of the company say that it is capable of duplicating hydraulic field conditions for the more than 10,000 different types and sizes of pumps currently being produced. An important feature of the laboratory are facilities for testing large centrifugal refrigeration equipment.

▶ At recent meetings of field sales personnel of *CHRYSLER AIRTEMP, VICE PRESIDENT J. F. KNOFF,* revealed that the firm's February orders increased 55 percent over January orders and that February 1954 orders were 20 percent over February 1953 orders. Mr. Knoff attributed this to increased retail activity and mounting interest in residential air conditioning.

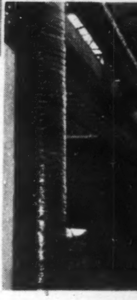
▶ The Tubular Products Section of the *AIR-CONDITIONING and REFRIGERATION INSTITUTE* has appointed *E. W. ERVASTI* chairman. Mr. Ervasti is manager of industrial sales for the Wolverine Tube Div. of Calumet & Hecla, Inc.

▶ *AIRLENCO INC.*, 198 Wayne St., Mansfield, Ohio, has taken over the proprietary business formerly operated as Air-Line Engineering Co. and will produce the same equipment with some additions to the line. Active officers of the new company are *T. J. FARQUHAR*, president and sales manager, and *C. N. WALTER*, secretary-treasurer and production manager.

Is the Protection You Buy
TIME-TESTED Like

TAPECOAT®

. . . the Quality
Coal Tar Coating



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There is one dependable yardstick for measuring the quality of protective material: How does it stand up over years of service?

You don't have to experiment when you specify TAPECOAT. It is quality coal tar coating, and coal tar is nature's own defense against corrosion.

Since 1941, when it was introduced as the first protective coating in handy tape form, TAPECOAT has proved its ability to keep vulnerable steel surfaces in "like new" condition year after year. *That's why it is specified by those who know that continuing protection is the first consideration.*

For 13 years, TAPECOAT has provided dependable protection on pipe, pipe joints, tanks, etc., above ground and under ground.

TAPECOAT comes in handy rolls in widths from 2″ to 24″. It's easy to apply and the coal tar provides both bond and protection at the same time.

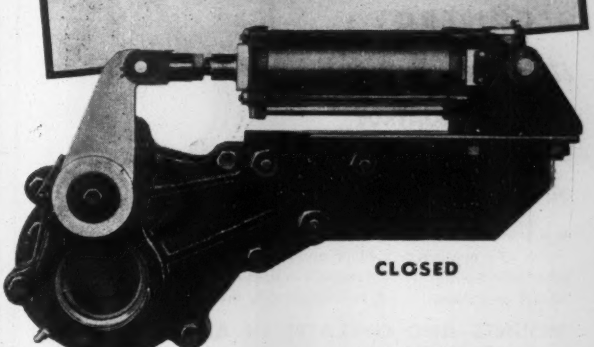
Write for brochure and recommendations on your corrosion problem.

The TAPECOAT Company

Originators of Coal Tar
Tape Protection

1555 Lyons Street, Evanston, Illinois

Everlasting
Cylinder-Operated
Valves



CLOSED

OPEN

Write for full information

Assure most accurate control of process work by using these units, which eliminate operator fatigue, can be regulated to operate at any speed and in automatic cycles, and can be remotely controlled either electrically or manually. These valves also have the straight-through flow and drop-tight seal which have made the non-wedging EVERLASTING Valves famous for almost half a century.

EVERLASTING VALVE CO., 61 Fisk St., Jersey City 5, N. J.

Everlasting
Valves

FOR EVERLASTING
PROTECTION

EV-369

TRADE MARK "EVERLASTING" REG. U.S. PAT. OFF

THE SEARCH ENDS!

when you discover the Sterlco®

Series 150-E TEMPERATURE CONTROL

it gives you...
ACCURATE CONTROL
DEPENDABLE PERFORMANCE
at a LOW COST

It is a self-actuated, completely automatic modulating control valve — for any heating or cooling application using steam, water, or other heat transfer fluids. Available in sizes and temperature ranges for all operations...and, remember, only the Sterlco Series 150-E

MOUNTS AND OPERATES IN ANY POSITION

UPSIDE DOWN · AT ANY ANGLE · HORIZONTAL · UPRIGHT

Sterlco® THERMOTROL

Rugged, dependable, automatic, individual radiator temperature control. Easily set to desired temperature—maintains it by modulating the flow of steam or hot water to the radiator in balance with air temperature. Self contained — easily installed without wiring or external connections.

Adaptable to Zone Control in Radiant Heat Systems — ask for details.

STEAM HEATING is MODERN, EFFICIENT and DEPENDABLE
Sterlco Products Distributed through
LEADING HEATING and PLUMBING WHOLESALERS

STERLING, INC.
3732 N. Holton St., Milwaukee 12, Wisconsin

CONDENSATION AND VACUUM PUMPS · HEATING SPECIALTIES · TEMPERATURE CONTROLS

NEW BOOKS & REPORTS...

Heat Conduction

The newly revised edition of *Heat Conduction*, by L. R. Ingersoll, O. J. Zobel and A. C. Ingersoll, contains a great deal of new information on the theory of heat conduction, largely along practical lines. Practical applications are given for the geologist, geographer, engineer, mathematician, physicist and chemist. A special feature is the theory of permanent sources. This is carried out for all three dimensions, but most of the applications center about the two dimensional case, such as the theory of ground pipe heat sources for the heat pump. Other features of the revision are a modernized nomenclature, many new problems and illustrations, and the segregation of descriptions of methods of measuring heat-conduction constants in a special chapter.

Another feature is the discussion of auxiliary graphical and other approximation methods by which many practical heat conduction problems may be solved with only the simplest mathematics.

Published by the University of Wisconsin Press, 811 State St., Madison. It is priced at $5.00 a copy.

Air Conditioning and Refrigeration Definitions

After several years of study, the *Proposed American Standard on Definitions* used in the refrigeration and air conditioning industry was recently printed in *Refrigeration Engineering*, the journal of the ASRE. The 28 page publication, containing approximately 750 definitions of words, terms and phrases used by air conditioning and refrigeration personnel, forms Part D of the Proposed American Standard Refrigeration Nomenclature for Texts and Drawings.

Copies may be obtained from the American Society of Refrigerating Engineers, 234 Fifth Ave., New York 1.

Remedies for Corrosion

Two articles recently appeared in the journal of the National Association of Corrosion Engineers dealing with methods of combatting corrosion. The first, *Internal Coating of Pipe in Place*, covers the procedures and results of coating internally several miles of old aluminum, steel and new steel pipe.

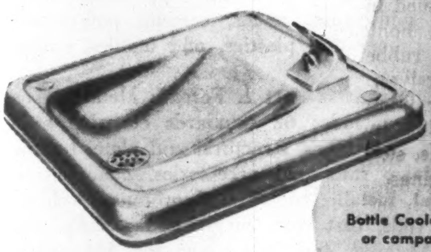
The second, *Corrosion and its Control in Aluminum Cooling Towers*, presents data and illustrations from a field study in which test samples of six commercial aluminum compositions were immersed in circulating water in operating cooling towers. Results are compared of the effects of untreated and treated circulating water.

The journal of the NACE is published at 1061 M & M Bldg., No. 1 Main St., Houston 2.

Bituminous Coal Annual

The *Bituminous Coal Annual for 1953* presents a series of facts and figures showing why the coal industry, "which has all the elements necessary for a successful enterprise, is being hurt by factors over which it has little control." These factors include rising capital expenditures, increasing costs of supplies, higher wages, rising freight rates and competition from other fuels. The book also presents the latest available statistics on production and consump-

Temprite



WITH THE

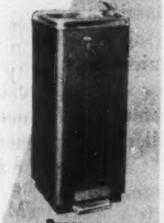
DEEP

STAINLESS STEEL

TOP

EVERYTHING about the beautiful Temprite Water Cooler is generous, substantial, sturdy! The sanitary stainless steel top is *extra deep* . . . the anti-splash guard *extra full* . . . The flow of cool water won't splash, won't spurt, won't find its way on to the surrounding floor!

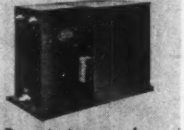
Dismantle the Temprite, if you wish; look inside and you will see the fully corrosion resistant cooling system, the *extra strong* all-welded steel frame, and *heavy gauge* sheet steel cabinet panels. Built for years of service. The compressor is hermetically sealed and lubricated for life. Everything about the Temprite line spells *EXTRA* QUALITY!



Pressure Bubbler Coolers in Nine Models.

Bottle Coolers in standard or compartment type.

Bubbler type compartment coolers



Remote type coolers in three sizes.

Temprite accessories include wall fountains, glass fillers, transformers, optional push-button control assembly, etc.

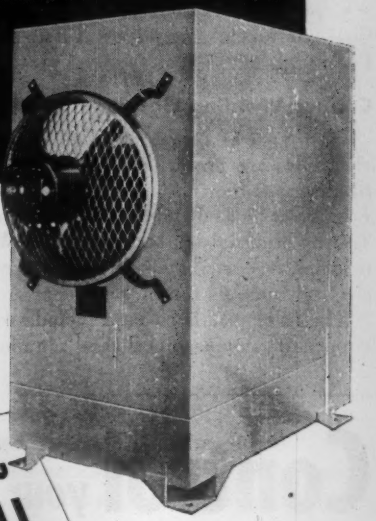
Since 1929
Temprite
PRODUCTS CORPORATION

P.O. BOX 72-L
EAST MAPLE RD.
BIRMINGHAM
MICH.

COOLING TOWER

by

KRAMER



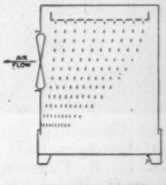
3 to 8 Ton

SCIENTIFIC NEW FILL

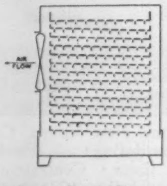
MORE CAPACITY
The redistributing decks keep the water uniformly suspended, providing maximum contact between air and water.

LONG LIFE
Casing and sump are heavy gauge steel, hot dipped galvanized after fabrication. Redistributing decks are metal and fireproof.

EASY INSTALLATION
Unit is shipped assembled but can be knocked down to eliminate rigging costs. One fitting required for drain and over-flow.



Conventional Fill



Kramer Fill

Write for Catalog R-225

KRAMER TRENTON CO.
Trenton 5, N.J.

tion of bituminous coal through 1952, as well as information on employment and reserves.

Publisher of the book is the Bituminous Coal Institute, National Coal Association, 802 Southern Bldg., Washington 5, D. C.

Heat Extraction from Combustion Gases of Coal

Frontiers in Heat Extraction from the Combustion Gases of Coal is aimed at providing a clear understanding of how coal performs in power boilers. Outlined in the paper are the heat-release rates of boilers and furnaces, heat-absorption rates of the various parts of the boilers, and the effect of boiler design on ash behavior.

Copies are available at 25 cents each from Bituminous Coal Research, Inc. 2609 First National Bank Bldg., Pittsburgh 22.

Copper Welding Electrode Specifications

Five types of copper and copper-alloy covered and bare electrodes are prescribed in the new edition of the *Tentative Specifications for Copper and Copper-Alloy Welding Electrodes* issued jointly by the American Society for Testing Materials and the American Welding Society. The new edition was prepared primarily to standardize the electrodes used in inert gas, metal arc welding.

The filler metals covered include copper, copper-silicon, copper-tin, copper-nickel, and aluminum bronze.

A table gives the chemical analysis of the different classifications in each group and standard tests for verifying conformity of a given electrode to the standard requirements. New packaging requirements are provided for inert gas, metal arc welding electrodes. The appendix contains information to aid in selecting the most suitable filler metal for a particular application.

Copies of the book can be obtained at 25 cents each from the ASTM, 1916 Race St., Philadelphia 3, or the AWS, 33 W. 39th St., New York 18.

Supplements to ASTM Standards

Recently published are the *1953 Supplements* to the 1952 *Book of ASTM Standards,* which is released triennially. Issued in seven parts, the supplements cover ferrous metals, nonferrous metals, cement, paints and polishes, fuels, rubber and plastics, and textiles, water, paper and adhesives.

Of particular interest is Part 1, Ferrous Metals. The 380 page section includes 62 standards covering steel piping materials, steel tubes, structural and plate, bolting materials, forgings, rails and accessories, concrete reinforcement steel, metallic coated steel products, welding electrodes and rods, cast iron, magnetic materials, and the Tentative Methods and Definitions for Mechanical Testing of Steel Products.

The supplements, in a heavy paper cover, can be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, at $3.50 per part or $24.50 for the complete set of seven parts.

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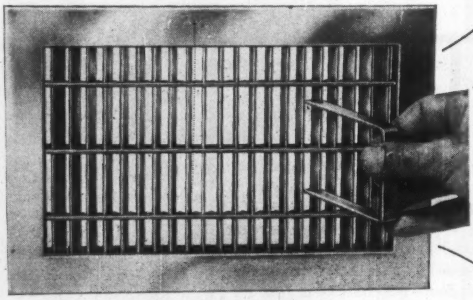
Designed for installation where quality and performance are of prime importance. They may be found in America's newest and finest schools, hospitals, and industrial plants. They have been installed recently in the new plant of Davis & Geck, Inc., manufacturers of sutures and surgical specialties, Danbury, Conn. (shown below).



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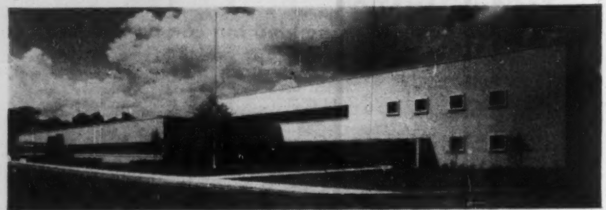

Architect — Leo Caproni, New Haven, Conn.; Consulting Engineer (Heating and Ventilating) — Paul D. Harrigan, Hill & Harrigan, New Haven, Conn.; Contractor — G. R. Cummings Company, Meriden, Conn.; Gen. Contractor — H. Wales Lines Co., Meriden, Conn.

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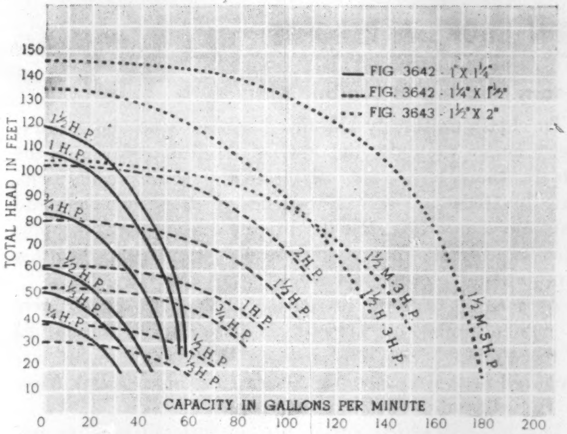

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If your pumping needs fit on this chart, these pumps will save money for you. Here are capacities to 180 GPM, heads to 145 ft., in the performance ratings of this line of Goulds "close-cupld" centrifugal pumps, designed especially for air conditioning service.

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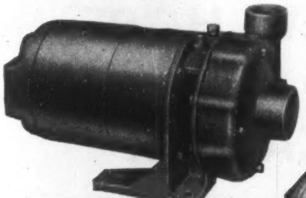

Fig. 3642, 1" size with ¼, ⅓, ½, ¾, 1, or 1½ HP motor. 1¼" size with ⅓, ½, ¾, 1, 1½, or 2 HP motor.

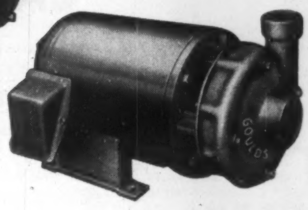

Fig. 3643, has 1½" discharge, available with 3 HP or 5 HP motor.

For additional details about these pumps, write for Bulletin 624.A-3.

Whatever your pumping requirements may be, there are Goulds pumps that will fill them economically and efficiently. We'll be glad to consult with you on any liquid-handling problem. Just write to Goulds Pumps, Inc., Seneca Falls, New York.

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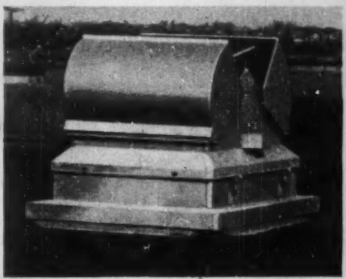
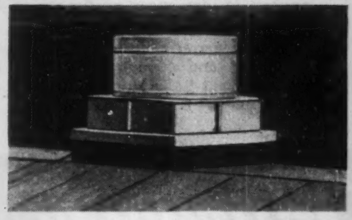


Whirlout



FOR many situations where fast powerful exhaust is desired above furnaces, ovens, pickling vats, or any operation or condition that causes heat, smoke or fumes, the straight-through type roof ventilator throws out unwanted elements in a hurry. Outgoing flow is as direct as possible, encountering practically no friction or obstructions. The air stream from a motor-driven fan automatically opens the ventilator and keeps it open while operating. Rain and snow are swept aside while unwanted air is being expelled. Swartwout has engineered these ventilators carefully for long life and completely satisfactory performance. They mount on any type of roof.

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Roof Ventilators and Ventilating Louvers
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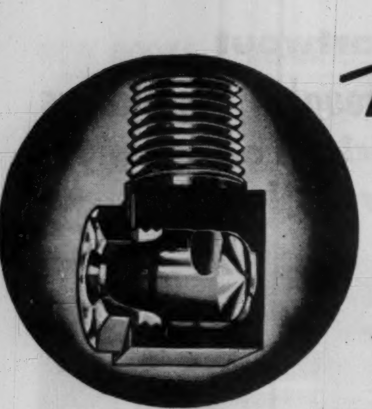

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These are "non-clogging" nozzles with a single large tangential lead hole to the swirl chamber that will never clog from any impurities small enough to pass through the orifice. Swirl chamber is conical on both ends and pivots liquid like a top to produce an exceptionally fine, evenly distributed, balanced spray of about 80° included angle. Wider spray angles up to 130° can be furnished to order.

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NEW BOOKS & REPORTS

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As a result of work carried on at the U.S. Department of Agriculture's Forest Products Laboratory, maintained at the University of Wisconsin in Madison, a report was prepared on *Steam Heating Systems in Lumber Dry Kilns* by E. F. Rasmussen, laboratory engineer.

This report, which deals only with steam heating systems of the pipe coil type, covers the various types of coils used, coil drainage, flow of steam, cause and effects of air and water binding, excessive radiation, control of steam pressures, main feed lines, maintenance of heating systems and heating systems in use in new kilns.

OTHER BOOKS AND REPORTS . . . .

ENGINEERING ANALYSIS—emphasizes what must be done to translate engineering situations into mathematical language and the necessary steps to be taken after a mathematical result has been obtained. It deals specifically with such matters as defining the problem to be solved, deciding what principle to apply, choosing coordinate

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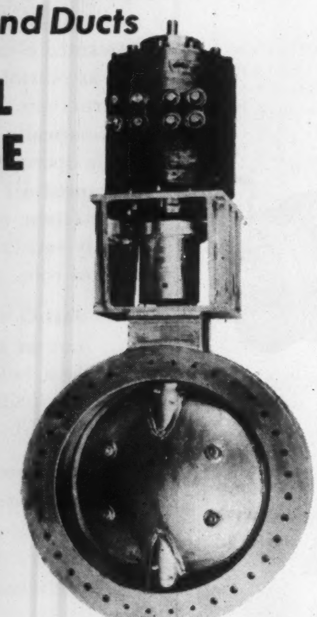

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CANCER

THE FIGHT against man's cruelest enemy is far from won. If present rates continue, 23 million living Americans will die of cancer—230,000 *this year*. And thousands of these will die needlessly—through cancer that could have been cured if treated in time.

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MUCH MORE, of course, remains to be done. So please make *this* year's gift a really *generous* one!

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MAN'S CRUELEST ENEMY
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Grant Wilson DUX-SULATION with its K factor of .27 BTU, saves 3 out of 4 degrees of temperature which are otherwise lost. *In heating,* DUX-SULATION gets more heat from the source to the register at greater fuel savings. *In Cooling or Air-Conditioning,* DUX-SULATION prevents heat gains . . . delivering proper air output with minimum operation of any system's equipment: compressors, motors, turbines, valves, pumps. Power, water and repair costs are lowered . . . overload on refrigeration equipment relieved.

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Grant Wilson Woven Asbestos FLEXI-DUCT Tape stops noise and vibrations in all duct systems by isolating them at their source. Mechanical rattles, starting and stopping screeches, shaft whine, fan hum . . . all natural attendant noises to a blower' operation . . . can be confined to the blower housing by incorporating a flexible joint made of FLEXI-DUCT tape. Installation of such a joint is simple . . . tape or bolt FLEXI-DUCT to equipment and duct work with little time and effort. Network of ducts can be easily sectionalized . . . positively precluding sound travel by conduction . . . by interspersing FLEXI-DUCT joints throughout.

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FLEXIFLO diffusers assure uniform air distribution with built-in equalizing deflectors which are easily adjustable *after* installation. Rapid draftless mixture of supply and room air is assured.

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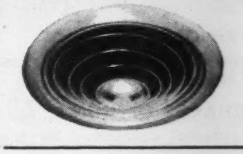

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TYPE R—Air travels in a constant pattern parallel to the ceiling regardless of volume adjustment.

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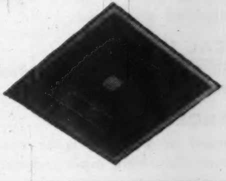

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TYPE H — Fully adjustable square diffusers and fixed rectangular 2, 3, and 4 way diffusers.

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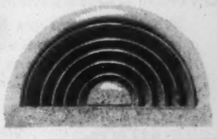

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Provide optional connection for piping to boiler.

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Close coupled pump is quiet. Pump and Motor mounted on rubber.

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NEW BOOKS & REPORTS

Continued

systems, methods of checking, choosing dimensionless variables, and sketching the curves. Authors are D. W. Ver Planck and B. R. Teare, Jr.

It is priced at $6.00 and is available from the publisher, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16.

SELECTED BIBLIOGRAPHY on BUILDING CONSTRUCTION and MAINTENANCE, National Bureau of Standards Building Materials and Structures Report 140—gives sources of information concerning building construction and maintenance. It contains titles of papers dealing with the practical aspects of building construction and some publications of a more technical nature.

Copies of the report may be ordered from the U. S. Government Printing Office, Washington 25, D.C., for 30 cents each.

PRACTICAL PIPING FLEXIBILITY, DESIGN & FLOW—including viscous liquid flow tables, pumping data and discussions on thermal stress in plates and vessels. A new method is presented for obtaining quicker and more uniform results in checking thermal stress and reaction in piping arrangements by the use of graphs and charts. A more detailed review of the book will appear at a future date.

Written and published by W. A. Thomas, 2742 Philadelphi Ave., Pittsburgh 16, the volume is priced at $25.00 a copy.

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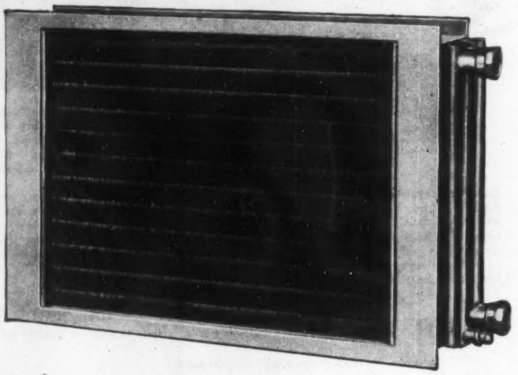
For Use In Combination With Air Conditioning Coils Or As Tempering and Booster Units In Long Heating Ducts.



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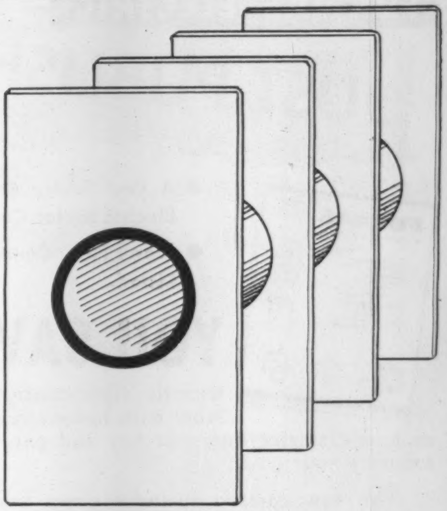

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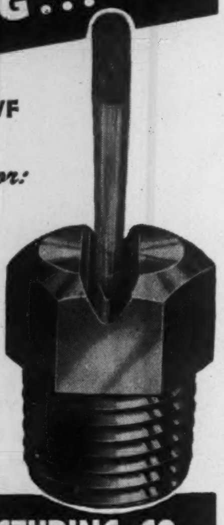

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NEW BOOKS & REPORTS

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ENERGY TRANSFER in HOT GASES — proceedings of a symposium held in 1951 by the National Bureau of Standards. Covered are the problems of radiation from flames and hot gases and the basic chemical and physical mechanisms governing energy transfer in those media. Sixteen papers are included in the volume.

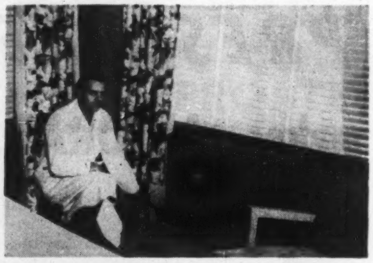
Copies of Circular 523 may be secured from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for $1.50.

SYMPOSIUM on NON-DESTRUCTIVE TESTING — presented at the 50th meeting of the American Society for Testing Materials in New York. It contains non-destructive testing methods and techniques in use throughout the world. Although it discusses principally the testing of metal, the symposium provides data and ideas for non-destructive testing of other materials. Two papers of special interest are "Comparison Radiographs of Welds," and "Weld Radiography: A Tentative Method for Quantitative Evaluation of Defects."

The booklet, priced at $2.00, may be ordered from ASTM headquarters, 1916 Race St., Philadelphia 3.

CONSTRUCTION DURING FIVE DECADES, Historical Statistics — 1907-52 — handbook of historical information on construction. Included are statistics on urban and rural building, building materials prices, wage

Radiator
Traps
Built to
Last



The above picture shows Chief Engineer William Hillner of Northern Hotel, Billings, Mont., pointing to one of 1281 Sarco type H Radiator Traps which have been in successful service in the hotel for 10 years.

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Advt. 609

NEW BOOKS & REPORTS

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scales, union rulings, work stoppages and injuries, and federal contract awards.

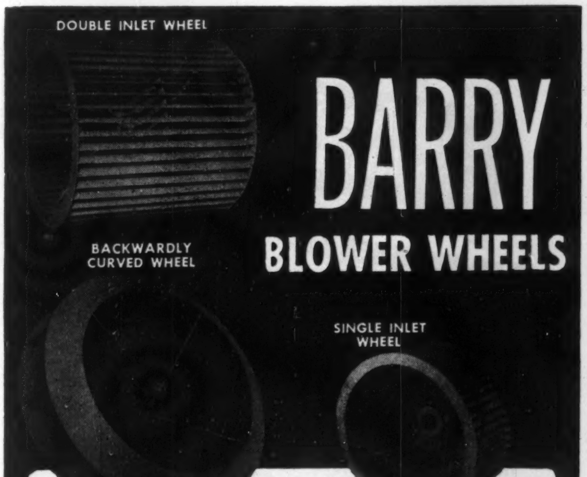
Bulletin 1146 is sold for 45 cents a copy and may be ordered from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

INSTRUMENT SOCIETY OF AMERICA 1953 PROCEEDINGS—contains all 74 technical papers presented before the Eighth National Instrument Congress. Included are reports on instrumentation for production processes, testing instrumentation, instrument operation and maintenance, physical properties measurement, aeronautical instrumentation, instrumentation for transportation, medical instrumentation, geophysical instrumentation, and process control instrumentation.

Price to members is $5 and to non-members, $10. Copies may be ordered from the Instrument Society of America, 1319 Allegheny Ave., Pittsburgh 33.

GOOD PAINTING PRACTICE, Vol. I of Steel Structures Painting Manual—describes surface preparation and painting in various industries. Some of the subjects include painting steel vessels for salt and fresh water service, painting steel tanks, and protection of pipe lines and other underground structures.

The 432-page book, bound in leatherette with hard covers, may be ordered from the Steel Structures Painting Council, 4400 Fifth Ave., Pittsburgh 13, at $6.00 a copy.



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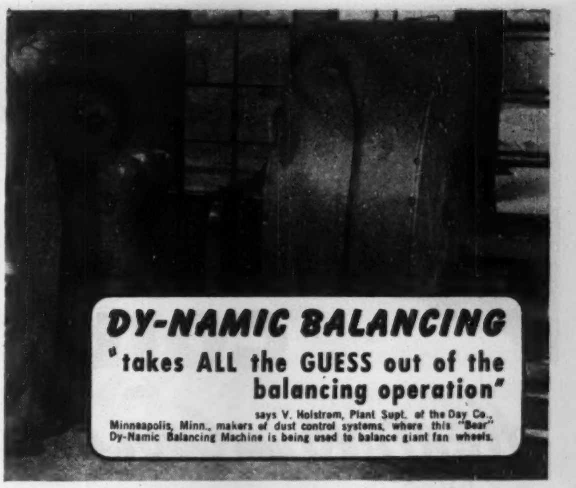

DY-NAMIC BALANCING "takes ALL the GUESS out of the balancing operation"

says V. Holstrom, Plant Supt. of the Day Co., Minneapolis, Minn., makers of dust control systems, where this "Bear" Dy-Namic Balancing Machine is being used to balance giant fan wheels.

SIMPLIFIED OPERATION of "Bear" Dy-Namic Balancing Machines is so fast, so economical, so easy to learn that manufacturers, maintenance shops and others are employing this revolutionary method with top-production results. No complicated manipulations to learn! Average shop man can learn to balance in a few hours! Get full details by sending for **FREE DY-NAMIC BALANCING MANUAL** . . . tells how you can eliminate noise and vibration, reduce wear and improve performance of rotating parts, *quickly, accurately*, and *economically*. Write: Bear Mfg. Co., Dept. H-16, Rock Island, Ill.

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balance rotating parts weighing from 4 oz. to 8 tons

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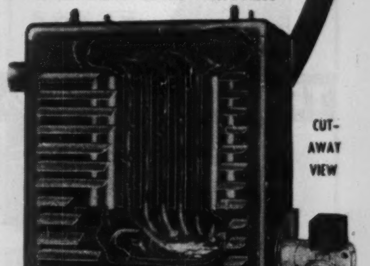

*Patents Pending

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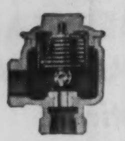

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MEETINGS AND CONVENTIONS...

HEAT TRANSFER — two week summer course at Massachusetts Institute of Technology on modern developments in heat transfer, July 6-16. The course will cover fundamental concepts and recent findings in the field of heat transfer. It has been designed to fill the needs of teachers, research workers and development engineers.

Tuition for the course in $160. Application blanks and further information are available from the Summer Session Office, Room 7-103, MIT, Cambridge 39.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 234 Fifth Ave., New York 1—41st semi-annual meeting, July 11-14, Hotel Olympic, Seattle, Wash. During a series of four forums, discussions will be held on "Oil Problems with 'Freon 22'," "Capillary Tubes vs. Expansion Valves on Commercial Self Contained Air Conditioners," "Refrigeration Problems in the Meat Packing Industry," and "New Thinking on Short Form Air Conditioning Load Calculations."

WESTERN PLANT MAINTENANCE SHOW, 759 Monadnock Bldg., San Francisco 5—West's first plant maintenance show, July 13-15, at the Pan Pacific Auditorium, Los Angeles. Produced by Clapp & Poliak, Inc., the show will emphasize the specialized problems of maintenance and engineering faced by western industry which has undergone tremendous expansion since World War II.

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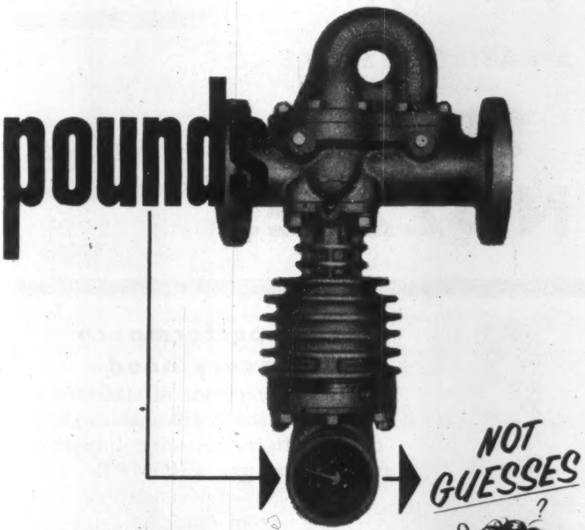
The food processing industry in the West will be the subject of several demonstrations and discussion groups. One of the problems to be discussed is how to handle air conditioning where certain control processes are involved.

To be held concurrently with the Show will be the *WESTERN PLANT MAINTENANCE CONFERENCE* at the Ambassador Hotel in Los Angeles. The Conference is aimed at solving the maintenance problems of production executives and management engineers.

The *NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION*—remaining short course in the 1954 series will be held July 13-16 at the University of Wisconsin. Tuition is $25. Subjects to be covered include school house heating, small pipe perimeter heating, combustion efficiency, air distribution systems and summer cooling. Further information is available from Prof. R. C. Tegtmeyer, Mechanical Engineering Dept., Madison.

INSTITUTE OF BOILER AND RADIATOR MANUFACTURERS, 62 E. 42nd St., New York 17—short courses in boiler heating at Purdue University and the University of Illinois. The short course in hot water and steam heating at Purdue will be held during the week of July 19. It will be an elementary course emphasizing the



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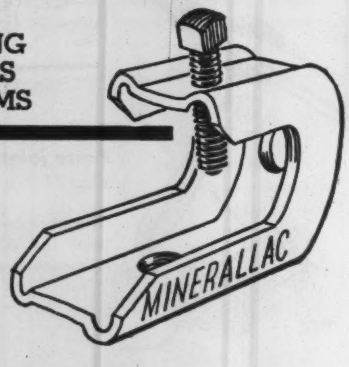

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MEETINGS & CONVENTIONS

Continued

principles of design and installation based on the I-B-R installation guides.

The short course at Illinois is scheduled for July 27-30. It will be an advanced course with emphasis on summer cooling in connection with hot water and steam heating systems and research on snow melting systems. Students wishing further information may write to R. K. Newton, Supervisor of Engineering Extension, Room 116, Illini Hall, 725 S. Wright St., Champaign, Ill.

I-B-R SCHOOL OF MODERN HEATING—fall schedule of schools includes: Pittsburgh, Pa., August 17-19; Cincinnati, Ohio, August 24-26; Knoxville, Tenn., August 31-September 2; Chattanooga, Tenn., September 14-16; Nashville, Tenn., September 21-23; Winston-Salem, N. C., September 28-30; Charlotte, N. C., October 5-7. Tuition for the I-B-R School is $28.00. Those wishing further information may obtain it from the Institute of Boiler and Radiator Manufacturers, 60 E. 42nd St., New York 17.

GAS MEASUREMENT—14th annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, August 23-25. Subjects to be covered include fundamentals of gas measurement and special session on domestic meters, large capacity meters, orifice meters, auxiliary measurement instruments, automatic control instruments, planning and design of installations, and pressure regulators, motor valves and related equipment.

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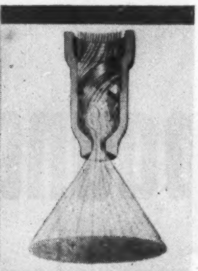

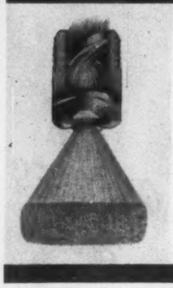

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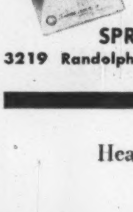


MEETINGS & CONVENTIONS

Continued

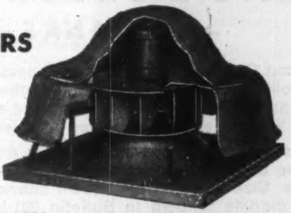
INTERNATIONAL INSTRUMENT CONGRESS AND EXPOSITION, 845 Ridge Ave., Pittsburgh 12. A number of professional societies are participating in making plans for the meeting to be held in Philadelphia. Technical sessions are scheduled to begin September 13 and continue until September 25.

EIGHTH NATIONAL CHEMICAL EXPOSITION, The American Chemical Society, Chicago Section, 86 E. Randolph St., Chicago 1—Chicago Coliseum, October 12-15. Theme of the exposition is "The Chemical Industry in Everyday Living."

FIRST INTERNATIONAL AUTOMATION EXPOSITION 845 Ridge Ave., Pittsburgh 12—exhibit on automatic machines, factories and industries to be held the week of November 29 at the 242nd Coast Artillery Armory, 14th St. off Sixth Ave., New York.

The exhibit is under the direction of Richard Rimbach.

21st *NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING*, under the management of the International Exposition Co., 480 Lexington Ave., New York 17—Commercial Museum, Philadelphia December 2-7.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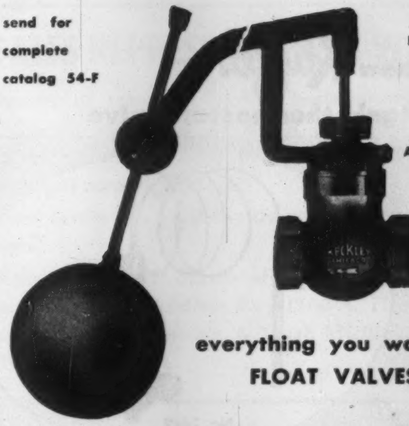
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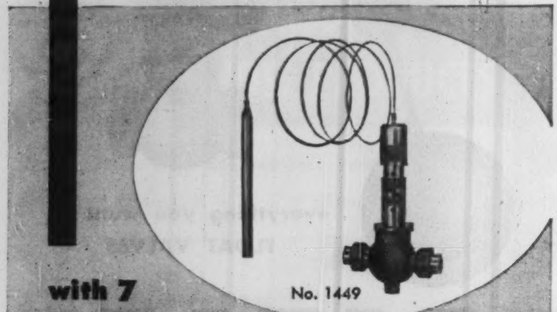

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MEETINGS & CONVENTIONS
Continued

WORLD SYMPOSIUM on APPLIED SOLAR ENERGY, sponsored by Stanford Research Institute, Stanford, Calif.—January 12-15, 1955, Westward Ho Hotel, Phoenix, Ariz. Scientists and industrialists will attempt to evaluate present knowledge in terms of practical applications. Lewis W. Douglas is chairman of the meeting. Merritt L. Kastens, assistant director of Stanford Research Institute, is vice chairman.

AMERICAN SOCIETY OF HEATING & VENTILATING ENGINEERS, 62 Worth St., New York 13—61st annual meeting, January 24-27, 1955, Benjamin Franklin and Bellevue-Stratford Hotels, Philadelphia.

INTERNATIONAL HEATING & VENTILATING EXPOSITION—The Air Conditioning Exposition, January 24-28, 1955, Commercial Museum & Convention Hall, Philadelphia. Under the auspices of the American Society of Heating and Ventilating Engineers, and under the management of the International Exposition Co., 480 Lexington Ave., New York 17.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, Tulsa Section—Sixth Annual Corrosion Short Course for Pipeliners, February 16-18, 1955, Mayo Hotel. Thomas M. Ragland, Phillips Petroleum Co., is chairman of the course.

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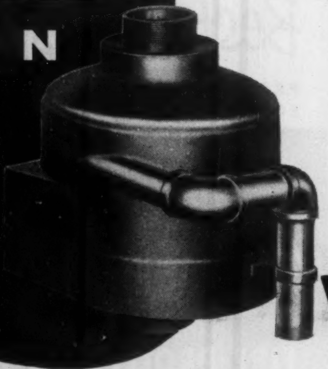

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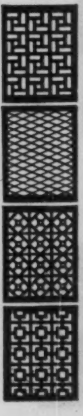

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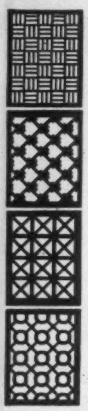

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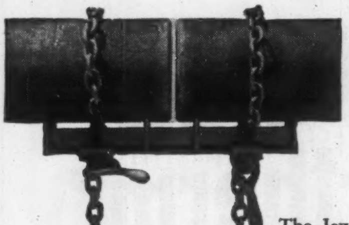

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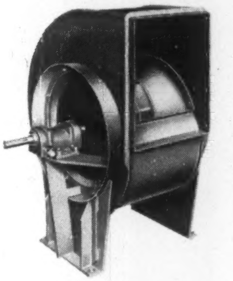
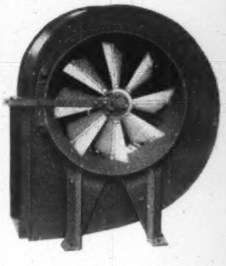
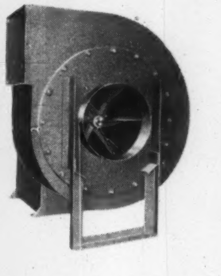
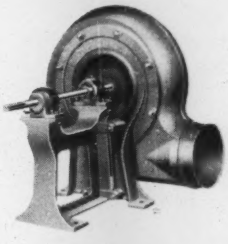
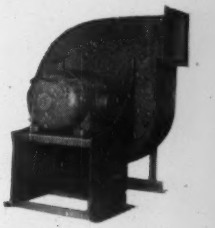

TYPE NH FANS operate at moderately high speeds. Available in 23 sizes — smaller sizes adjustable as to discharge. Capacities from 1,000 to 725,000 cfm. Wheels have backwardly inclined blades — non-overloading power characteristic.

TYPE HV are slow speed, exceedingly quiet fans. 28 sizes offered — smaller sizes readily adjustable to eight standard discharges. Capacities from 200 to 200,000 cfm. Forward curved multiblade wheels. Unit shown has Vortex Control in inlet.

TYPE XL FANS, with high efficiency characteristic, range up to 130,000 cfm, 18" SP, 60" inlet diameter. Three wheel types, 16 fan sizes — smaller sizes adjustable as to discharge.

TYPE CI EXHAUSTERS are for smaller volume applications — 200 to 3,000 cfm; pressures to 22". Corrosion resisting cast iron housings. All 6 sizes adjustable as to discharge.

TYPE O BLOWERS deliver small to moderately large volumes — 250 to 25,000 cfm — at high pressures. 19 sizes — all adjustable as to discharge. Heavy steel plate construction.

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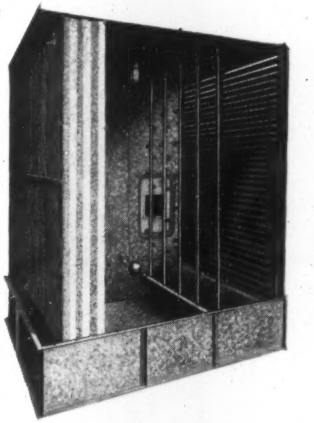
Air Washers and Unicoil Units

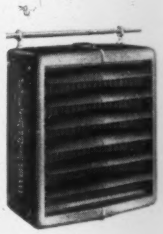
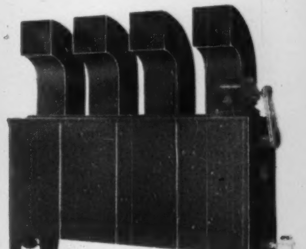
AIR WASHERS available in both spray and capillary types. (Spray type shown.) Capacities from 2,000 to 193,000 cfm. Ideal for comfort air conditioning, dust removal, product reclamation, and where maximum air cleaning efficiency is vital.

UNICOIL UNITS are recommended as an integral part of a central station system for heating or cooling, or both; or for complete air conditioning in comfort applications. Combine in a single unit all elements required for efficient heat transfer.

Unit Heaters

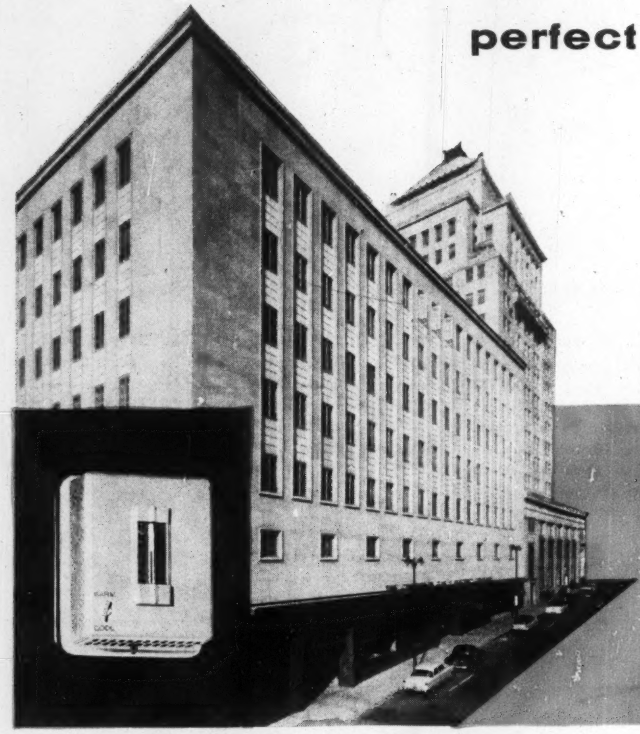
UNIT HEATERS, equipped with centrifugal multiblade fans, are available for either floor or suspended installation. Nine sizes have capacities ranging from 60,000 to 1,160,000 B.t.u. They operate on either steam or hot water. Clarco Heaters, equipped with propeller fans, are for heating smaller areas. Ten sizes, capacities 24,000 to 270,000 B.t.u., both vertical and horizontal types.



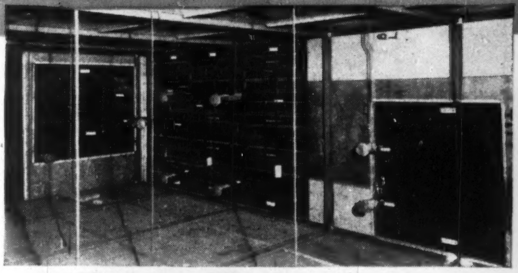
perfect working weather *all year 'round* with

JOHNSON AUTOMATIC TEMPERATURE CONTROL



Addition to The Cincinnati Gas & Electric Company, Cincinnati, Ohio. The Union Central Life Insurance Company, owner. The Cincinnati Gas & Electric Company, lessee. Harry Hake & Harry Hake, Jr., architects; James E. Allan, mechanical engineer; Frank Messer & Sons, Inc., general contractor; Peck-Hannaford & Briggs, heating, ventilating and air-conditioning contractors, all of Cincinnati.

Conditioned air for the perimeter of the building is supplied by Carrier Weathermaster units controlled by Johnson Heating-Cooling Thermostats and Water Valves. Other thermostats control a ceiling system supplying conditioned air to the interior areas.

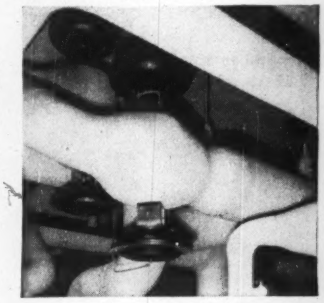


Inside this duct Johnson Damper Operators and Dampers insure precision control of the minimum and maximum outdoor air supply for Weathermaster units throughout the building.

Perfect indoor climate gives workers a big lift in the new Cincinnati Gas & Electric Company addition. Regardless of the outdoor temperatures, employees here enjoy healthful, refreshing climate-controlled weather that keeps worker efficiency and morale at peak levels.

Like the older adjoining building, this new air conditioned addition is equipped with a modern "Planned-for-the-Purpose" Johnson System of Automatic Temperature Control. On this, and *every other installation*, Johnson Control is tailored to the exact needs of the building and its occupants. Each Johnson System is planned, made and installed by Johnson to insure the desired results at the lowest possible operating cost.

Johnson engineers, working with heating and ventilating engineers, architects, owners and builders, have helped to plan control systems for the nation's outstanding office buildings, schools, hospitals, industrial plants, department stores and public buildings from coast to coast. Let a Johnson engineer from a nearby branch office solve your next temperature control problem. A talk involves no obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.



Thermostatically operated Johnson Double Diaphragm Valves are installed on chilled water and condensate lines for summer-winter changeover of the central air conditioning system.

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